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will not end here, but this dissertation marks an important milestone. Thank you for everything.

Paul Driessen

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Chapter 1: Introduction

This chapter introduces the topic of the thesis, green product innovations (GPIs), and its relevance. It will provide an outline of the research efforts, by defining the problem and defining the methodological steps that were taken throughout the research. Finally, a preliminary research framework is introduced to guide the first study.

1.1 Green Product Innovations

Over the last decades, firms have increasingly incorporated green issues in their development of product innovations, which has resulted in the introduction of GPIs. Green product innovations are defined as new products whose green performance is significantly better than conventional or competitive products (Peattie 1992; U.S. Congress Office of Technology Assessment 1992). This thesis thus adopts the view that green performance, or 'greenness', is a matter of degree, depending on the improvements made in reducing the environmental burden caused by the product's manufacturing, use, and disposal. Environmental burden of a product is determined by a product's performance on a variety of green issues, ranging from conservation of natural resources to safety for consumers' health (Di Benedetto and Chandran 1995; Graedel and Allenby 1995; Ottman 1998). The degree of improvement on each of these green issues also varies. Consider the following examples, illustrating the nature of GPIs, as well as their antecedents and consequences:

- Responding to regulatory demands, Maytag introduced its Neptune washing machine, which can achieve an annual USD 150 saving in water and energy, in the United States. Although priced at a 100% premium, its sales are "robust", and it has been awarded a number 1 rating in *Consumer Reports* (Ottman 2003).

- Responding to public debate in Sweden, Husqvarna introduced its Solar Mower, which is operated by solar power and almost silent. Targeted at a niche market, the product has not been a sales success, but has increased brand awareness, generated enormous media interest, and helped to establish a reputation of being an innovative company (Bragd 1997).

- Responding to consumer needs, Earth's Best developed a full line of organic baby food, which is produced using farming techniques that eliminate polluting chemicals and nitrogen leaching. Its market share is 75% in the "organic baby food" niche market, and 79% of U.S. consumers believe it is the "healthiest" baby food on the market (Hain Celestial Group 2002).

- Responding to electrical vehicles developed by other car manufacturers, Toyota introduced in 2001 its Prius sedan, which combines internal combustion and electrical engines. Toyota claimed it to be profitable in 2003 already, and sales are projected to reach 300,000 in 2005 (Ottman 2003).

- Responding to product claims of "degradability" of competitors and consumer environmental awareness, Mobil Oil introduced Hefty Degradable trash bags. In 1990, seven U.S. states filed lawsuits against Mobil Oil, resulting in settlements totaling USD 165,000 and withdrawal of the "degradability" advertising claim (Greenpeace International 1992).

These examples show a diversity in stakeholder interests being addressed by GPIs, as well as the mixed rewards that firms have reaped from them. GPI was already introduced as a concept in the marketing literature in the early 1970s in a *Journal of Marketing* article (Varble 1972), but the antecedents and performance consequences of GPI remain largely unexplored (Menon and Menon 1997; Banerjee et al. 2003; Pujari et al. 2003). In marketing practice however, GPI has become part of today's firms' strategies. In 1990, 10% of all introductions in the U.S. were claimed to be 'green' (cited in Baumann et al. 2002). Other statistics report that the share of green product introductions within all introductions in the U.S. rose from 2.8 percent in 1988 to 9.5 percent in 1997 (Fuller 1999). In some industries, GPI is even more widespread. In the UK cosmetics industry, only 4 out of 82 surveyed firms had *not* introduced a product to attract environmentally conscious consumers by 1990 (Prothero and McDonagh 1992).

Notwithstanding its incidence in marketing practice, the introduction of green product innovations became a controversial issue. GPIs have been both heralded as a powerful solution to end the 'stalemate' between economy and environment (Porter and Van der Linde 1995a) as well as bashed by special interest groups and critical consumers as an exploitative effort to 'greenwash' what are essentially polluting products (Zinkhan and Carlson 1995; Mohr et al. 1998). Marketing GPIs involves the inclusion of pro-social issues in product innovation strategy and strongly relates to the corporate social responsibility perspective of marketing (Menon and Menon 1997). The product innovation literature has so far offered very little on how corporate social responsibility translates into product innovation management, beyond a cursory description in textbooks (e.g., Urban and Hauser 1993; Crawford and Di Benedetto 2000). The environmental management literature on the other hand has mostly studied GPI as a novel phenomenon (Baumann et al. 2002), although there is evidence that the development of GPIs is not fundamentally different from other product innovations (Pujari et al. 2003). By investigating GPIs, thus uncovering subtle and substantial differences with other product innovations, an important step would be taken toward understanding how, why, and to what effect pro-social issues are included in product innovation strategies.

1.2 Scope of the Research

The objective of this dissertation is to develop and test a theoretical framework about the integration of green issues in product innovation that integrates findings in the extant product innovation literature with findings in the literature about GPIs. Both research streams would stand to gain from this effort, because it would extend the product innovation literature to include a wider range of managerial phenomena and would free the GPI literature from its isolationist perspective. Both research streams have provided insights on important characteristics of (green) product innovation strategy, as well as its antecedents and consequences. Therefore, the central problem of this dissertation is: *What are the antecedents, relevant characteristics, and consequences of GPI strategy?*

The scope of the research is restricted in two ways. Firstly, the research is limited to physical products. Most existing research into product innovation strategy as well as

research into GPI strategy is about physical products rather than services. Therefore, integration of both streams is best achieved when adopting the same focus as existing research in both streams. Secondly, the research deals with product innovations rather than process innovations. There exists, however, a continuum ranging from 'pure' product innovations to 'pure' process innovations (Bhoovaragh et al. 1996). Many GPIs involve some degree of process innovation, e.g. when a firm uses a new manufacturing process that reduces the environmental impact. Green products often possess both product-specific and process-specific green improvements (Fuller 1999). In order to be included in this research, improvements must be directly associated to the product. Products from firms that only have made efforts to improve support processes (e.g., a car manufacturing plant that has a coffee-cup-recycling program) or products from firms that only have adopted corporate-level green policies (e.g. sponsoring a wildlife conservation organization) are not green products and outside the scope of this research. Note that the scope of the research is broad in two aspects: the first is what constitutes an innovation, and the second is what constitutes a green innovation. By studying both radical and incremental innovations, as well as 'deep green' and 'light green' innovations, the characteristics of GPIs will be better understood.

1.3 Methodological Outline

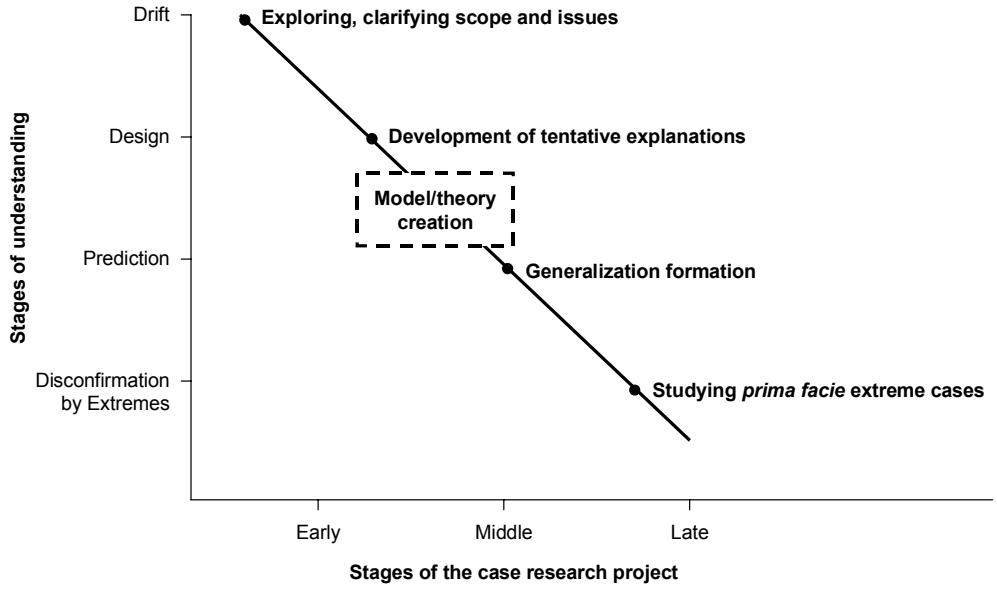
The thesis will follow a case research process to develop a model of antecedents and consequences of GPI. Why is the case research method appropriate in this study? In general, choice of a method should depend on the purpose of the research and the phenomenon under study (Bonoma 1985; Yin 1994). The purpose of this study is theory development, for which the case research approach is favored (Bonoma 1985; Eisenhardt 1989). It involves reaching an understanding by asking questions of the 'how' and 'why' type, rather than questions of the 'what', 'who', and 'where' type, which favor surveys or studying secondary data (Yin 1994). The phenomenon under study is suitable for a case research approach if the phenomenon cannot be isolated from its context (Bonoma 1985; Yin 1994) *and* if the phenomenon is contemporary rather than historical (Yin 1994). GPI is a phenomenon that cannot be separated from its context, because the context of organizational decisions surrounding GPIs is large and potentially important. The context is both large, in that it potentially involves studying a large number of variables, as well as intertwined with the phenomenon under study, in that it is partly about the way a firm deals with its environmental context (cf. Yin 1994). The latter implies that the phenomenon by definition cannot be detached from its context.

Both Bonoma (1985) and Eisenhardt (1989) have proposed procedures that can be used to develop models and/or theory from case-based observations. Such an approach is favored when a new phenomenon emerges or when observations cannot be adequately explained by current theoretical perspectives (Eisenhardt 1989). As Eisenhardt (1989) summarizes, "[…] building theory from case study research is most appropriate in the early stages of research on a topic or to provide freshness in perspective to an already researched topic." The research topic at hand, GPI, has a bit of both qualities attached to it. Its study is clearly in an early stage, since the phenomenon has only been weakly present in corporate realities in the period from 1975 to 1985, and

only slowly expanded during the era of free market environmentalism in the mid 1980s (Menon and Menon 1997). Studying GPIs also offers a 'freshness in perspective', because integrating green issues into product innovation strategies extends the current product innovation literature by looking at the role that pro-social issues play.

Bonoma (1985) outlined four stages of a case research process in which model or theory creation plays a pivotal role (Figure 1.1). The first stage, 'drift', is highly exploratory and requires that the researcher familiarizes himself with concepts, locale, jargon, and a priori hypotheses that may exist in the field. The 'design' stage begins when the researcher starts to develop tentative explanations of the collected observations. It is in this stage that the model begins to conceptualize. In the third stage, 'prediction', the researcher has a model suggesting generalizations, and involves testing whether predictions made by the model hold in new, but similar, cases. The final stage, 'disconfirmation', entails finding cases in extreme conditions where the model might no longer hold and thus determining the limitations of generalizations. This last stage is aimed at possibly falsifying the theory.

Figure 1.1: A Process Model for Case Research (adapted from Bonoma 1985)



The process proposed by Eisenhardt (1989; 1991) concentrates on the more exploratory stages in Bonoma's process, i.e. the 'drift' and 'design' stages. She describes a highly iterative process that is tightly linked to empirical data to develop theories from case research. The process concentrates on using multiple case studies to allow for replication and extension among individual cases. Furthermore, she stresses the importance of methodological rigor during the process, such as the use of well-designed instruments and theoretical sampling.

Two important methodological issues of controversy in the case research literature can be linked to Bonoma's process, the first pertaining to the use of existing theory in the 'drift' and 'design' stages, the second to the suitability of the case research

method for testing theory as outlined in the 'prediction' and 'disconfirmation' stages. Regarding the first issue of controversy, Eisenhardt (1989) advocates the use of "neither theory nor hypotheses" at the start of a theory-building effort by case research, thus echoing the proponents of a 'grounded theory' approach. The advantage of this 'clean slate' approach is that the researcher retains flexibility in theory development and can thus avoid biases. She does admit, however, that is impossible to achieve the ideal in which the researcher is able to block out all existing knowledge. Others have taken a different stance. Yin (1994) advocates the development of a priori propositions before any data collection takes place, even in exploratory work. Also, Bonoma (1985, p. 205) points out that a researcher in the 'drift' stage should already begin "preliminary integration from literature". In fact, Eisenhardt herself suggests to use existing theory before data collection to determine the sampling of cases and states that "a priori specification of constructs can also help to shape the initial design of theory building research" (Eisenhardt 1989, p. 536). Although she admits that thinking about theoretical constructs before data collection is beneficiary, she stresses that researchers should avoid specifying relationships between constructs in the early stage of a case research project.

The research topic in this thesis is relatively novel. Therefore, it is appropriate to explore the field and discover constructs that are relevant to GPI. However, as noted above, the research topic of GPIs can also be seen as offering a fresh perspective to a well-developed field, i.e. the product innovation literature. Therefore, it seems unwise to totally ignore extant product innovation research, where findings have been corroborated across studies through literature reviews and meta-analyses (Craig and Hart 1992; Montoya-Weiss and Calantone 1994; Brown and Eisenhardt 1995; Balachandra and Friar 1997; Henard and Szymanski 2001). Both exploration of the field and the existing literature on product innovation seem fertile grounds from which to extract important constructs and on which to base at least 'loose propositions' of strongly established relationships as tentative generalizations.

The second issue of controversy is whether case research methods can be used to test theory and, if the answer to that question is positive, how this can be achieved. Opponents of the case research method generally accept case studies as a form of exploratory research, but feel that case studies cannot be used to test theories because the findings cannot be generalized to a larger population (see Yin 1994; Hillebrand et al. 2001). Others suggest however that case studies can be used to test a model by subjecting the generalizations emanating from the model to a prediction test (Bonoma 1985; Johnston et al. 1999; Wilson and Woodside 1999). In this logic, new case studies are compiled, and the outcomes of the new cases compared to the model predictions. Other case research methodologists present an alternative to this prediction based logic. They contend that theory-testing using cases is possible, yet difficult to achieve, through the principle of theoretical generalization. Theoretical generalization implies declaring findings of case research valid for all identical situations based on structural similarity of the cases *and* presenting logical argumentation to demonstrate the existence of causal relationships (Yin 1994; Hillebrand et al. 2001). By looking for theoretical generalization the strength of case research is utilized. If a model can be tested in this manner and found to be valid, there is evidence of true causal relationships, rather than statistical association. Finding true causal relationships might be

a researcher's holy grail because it is notoriously difficult to achieve. Most case research methodologists however agree that case research is capable of at least achieving limited testing of theories (Bonoma 1985; Eisenhardt 1989; Yin 1994; Johnston et al. 1999). The concept of theoretical generalization will assist in achieving this goal.

This research adopts a case research process based on Bonoma (1985), with adaptations to acknowledge both controversies. A three-stage approach is followed.

- *Stage one: exploration.* This step is necessary to familiarize the researcher with the field, similar to the 'drift' stage. This stage was limited in extend, because since the 1990s descriptive case studies of exemplars of green product design and public policy reports reporting firm's efforts in GPI have been publicized that allow a quick situation analysis (e.g., U.S. Congress Office of Technology Assessment 1992; Te Riele et al. 1994; Wong et al. 1996). Parallel to the study of these documents, limited fieldwork was undertaken in this stage: interviews with a chief design engineer responsible for eco-design at an electronics manufacturing company, with a consultant in green design and life cycle analysis, and attending executive seminars about environmental management. The result of this stage was a set of constructs that are deemed relevant to the topic of GPIs, as well as a set of 'tentative, loose propositions', rather than the clean slate advocated by proponents of a 'grounded theory' approach. Results of this stage are reported briefly in Section 1.4, which describes the preliminary research framework.

- *Stage two: theory-building.* This stage covers Bonoma's 'design' stage and model creation. In this stage, the highly iterative process proposed by Eisenhardt (1989) forms the basis for the inquiry. Because this stage was an iterative and lengthy process, theoretical insights gained from new literature also accrued during this period. This method of continued iterations was pursued, until a presumably robust model was construed. To enhance clarity the individual iterations are not reported. Instead, the methods and results of this stage are presented first in Chapter 2, followed by theoretical refinement and presentation of the full model in Chapter 3. However, it should be stressed that both insights from the case data as well as insights from the developing literature accrued interactively and in a parallel manner.

- *Stage three: theory-testing.* In this stage, the theoretical constructs from stage two will be refined and the model will undergo a limited test. Most case research authors agree that theory-testing through cases is to some degree possible but difficult. Thus, this thesis adopts the view that case research offers limited testing opportunities, by applying the principle of theoretical generalization (Hillebrand et al. 2001). Therefore, this study will not follow Bonoma's 'prediction' logic, but perform a limited test of the model by investigating structural similarity and discussing theoretical generalization. A detailed description of the methods applied in the theory-testing stage is provided in Chapter 4, and results in Chapter 5.

A possible fourth stage, similar to Bonoma's 'disconfirmation' stage, in which extreme cases are investigated that can demonstrate the limits to generalizability, is not within the scope of this thesis due to time and resource constraints. In order to build

good, robust theory, results of this study should be replicated not only by case research in extreme contexts, but by a multitude of methods including surveys, secondary data analysis, and experiments.

1.4 Research Framework

The preliminary research framework is based on the extant product innovation literature and studies about GPI strategy. As described in the previous section, the preliminary research framework serves two functions: to identify potentially relevant variables or constructs, and to obtain 'tentative, loose propositions'. The latter is achieved by identifying which variables are thought to be antecedents, characteristics of GPI strategy, and outcomes.

To identify a set of possible antecedents, elements of product innovation strategy, and outcomes, this research adopts the widely used perspective that market orientation influences product innovation strategy *en route* to performance (Gatignon and Xuereb 1997; Han et al. 1998; Lukas and Ferrell 2000; Langerak et al. 2004). Market orientation is conceptualized as customer orientation, competitor orientation, and interfunctional coordination (Narver and Slater 1990; Han et al. 1998). Also, technology orientation is included as an antecedent to product innovation strategy (Gatignon and Xuereb 1997; Han et al. 2001; Ingenbleek 2002). Furthermore, green orientation, conceptualized as the orientations that firms have toward green issues, is included as an additional antecedent (Banerjee et al. 2003; Pujari et al. 2004).

Four innovation characteristics are studied to describe GPI strategies. Relative advantage, the degree to which an innovation is superior to the product it supersedes or with which it competes, is an important innovation characteristic (Montoya-Weiss and Calantone 1994; Henard and Szymanski 2001). In order to understand differences between green and nongreen products, greenness is included as an innovation characteristics. Greenness is operationalized as a continuous rather than a dichotomous variable, to be able to contrast very green to nongreen products. Hypothetically, greenness can be a form of relative advantage, if consumers attach importance to green aspects associated with the product category, and if the innovation outperforms other products on one or more of these aspects (Driessen and Hillebrand 2002). The two characteristics are separated here because greenness is at the very focus of this study. Furthermore, newness of the innovation is included because it is a defining characteristic of any innovation and because studies show that it is associated with market orientation and performance (Lukas and Ferrell 2000). Innovation literature acknowledges three dimensions of newness: the degree in which a product entails new technology to the industry, the degree to which a product entails new technology or management practices to the innovating firm, and the degree to which an innovation is new to the customer (Garcia and Calantone 2002). As the fourth and final innovation characteristic, product costs are investigated, following Gatignon and Xuereb (1997). Product costs are the costs for researching, developing and manufacturing the innovation. GPIs are often blamed for increasing product costs, implying that differences with nongreen product innovations can be identified in this variable (Porter and Van der Linde 1995a).

In addition to the four innovation characteristics, GPI strategy can also be described by characteristics of the product introduction (Langerak et al. 2004). Introduction characteristics can be both strategic, i.e. targeting and positioning decisions, as well as tactical, i.e. marketing mix decisions.

Following the majority of product innovation research, various dimensions of innovation performance are seen as outcomes of GPI strategy. Innovation performance is conceptualized as possessing three dimensions, based on Griffin and Page (1996): financial performance, customer performance, and technological performance. Financial performance is operationalized as the profitability of the innovation compared to industry norms. Customer performance is conceptualized as the sales or market share relative to competitors. Technological performance refers to the degree in which a product established a technological 'platform' from which other innovation can be developed.

Finally, the market environment in which the product innovations were introduced provides a context that makes it easier to understand why products were introduced, the characteristics of the products, their introduction, and ultimately, why they became successful or not. Similarly, the importance of green issues in the industry has been shown to play an important role in modeling the antecedents of green company strategy (Banerjee et al. 2003). Market environment comprises both supply-side variables (intensity of competition and general supply structure of the market), demand-side variables (market volumes, general structure, major trends), market position of the firm, and the importance of green issues in the market.

Summarizing, the preliminary research framework consists of a set of antecedents (market orientation and green orientation), a set of elements of GPI strategy (innovation characteristics and introduction characteristics), a set of outcomes (financial, customer, and technological performance), and a construct that is a possible moderator (market environment). This preliminary research framework is used to guide the theory-building case studies, reported in Chapter 2.

Chapter 2: Case Studies for Theory-Building

The previous chapter briefly reported on the first stage of the study, the exploration stage. Building on the findings of this exploration stage, the goal of the current chapter is to identify subtle as well as substantial differences with conventional product innovation strategies. It reports the fieldwork undertaken in stage two of the study, theory-building. To achieve this goal, a multiple case study approach is used. The final objective of the case research in this stage is theory development. Or, as Bonoma (1985, p. 206) puts it succinctly when discussing the goal of data collection in case research: "In a word, the goal is understanding." This chapter first describes the method followed in the multiple case study approach, followed by a description of the data and summaries of the cases. The results of the case studies are reported in two ways. First, the results for each category of constructs included in the study are discussed, and constructs are identified that are important for understanding GPI strategy. Second, the results of a comprehensive cross-construct analysis are reported, in order to better conceptualize constructs and identify patterns. The discussion section reflects on the consequences of the findings for theory-building. The resulting theory, although developed parallel to the case research in this stage, is reported separately in Chapter 3 for reasons of clarity.

2.1 Method

The case studies for the theory-building stage were carried out following the research method advocated by Eisenhardt (1989). This section provides details about design, case selection, data collection, and analysis.

Design

Multiple case studies were used to build a theory on antecedents and consequences of GPI. In this manner, within-case analysis can be supplemented with a replication logic (Eisenhardt 1989). A replication logic means that the individual cases are to be seen as individual experiments, where each experiment strengthens the support for a certain generalization (Yin 1994). In this study, the individual cases are product innovations. Some constructs however, are better studied on an organizational level, like green orientation of the firm. Therefore, an embedded design (Yin 1994) was selected where firms are the units, and product innovations are the subunits. In the case research process for building theory from case studies, Eisenhardt (1989) recommends an incremental approach to determine the number of cases. The researcher should stop adding extra cases when theoretical saturation is reached, i.e. when the new information learned from adding an extra case becomes very little. Also, time and money constraints often restrict the number of cases that can be studied. As a rule of thumb, she states that "[…] a number between 4 and 10 cases usually works well" (Eisenhardt 1989, p. 545), because with fewer than four cases it is difficult to build decent theory, whereas with more than ten cases the effort may become overwhelming. In the theory-building stage of the research, eight product innovation projects are the case studies.

Please note that applying a case study in this phase of the investigation does not necessarily imply *exploratory* research. Although the multiple case studies in this chapter certainly have some exploratory characteristics, their purpose extends to being *explanatory* as well. Purely exploratory work was done in stage one of the study to develop a preliminary research framework (Chapter 1). Therefore, a more explanatory stance was adopted, in that the ultimate goal is to develop a *causal* model (Yin 1994).

Within the theory-building stage, multiple case studies were carried out following the research process advocated by Eisenhardt (1989). This research process can be characterized as (1) using multiple cases selected by theoretical sampling, (2) highly iterative, (3) using carefully constructed protocols and multiple data sources where possible, and (4) flexible during data collection to take advantage of the uniqueness of a specific case. The latter characteristic, flexibility or "controlled opportunism" (Eisenhardt 1989, p. 539), is legitimate in theory-building research, opposed to theory-testing research.

Case Selection

Two sets of selection criteria are used: the first set delineating the commonalities of the cases, the second set ensuring that the cases differ enough to contribute to theory-building. The first set includes four criteria. First, a case has to involve the development of a physical product, not purely a service, given that this is the object of study. Development can take various shapes: from incremental product upgrades to radically new product innovation projects. Second, the focal organization, i.e. the organization responsible for the development of the product, has to be within the geographical reach of the researcher, given time and resource constraints. As a consequence, all cases studied were in The Netherlands. Third, the product development project should be completed, and the product introduced to the market. This is necessary to study introduction characteristics and performance outcomes. Fourth, products have to be selected for which enough informants are accessible for research, for instance not having left the firm.

The second set, ensuring balance and variety, is more elaborate than the first set, and will be discussed in the remainder of this subsection. The second set of selection criteria is based on theoretical grounds, imposing variety on industry, firm size, and product innovations. The resulting case design is depicted in Table 2.1. The reasons for having diversity among the case studies is not to have a representative sample, as would be the case in survey-based samples, but to ensure that possibly important phenomena or innovation patterns are not left unobserved. The most important criterion in selection of cases should be to maximize what we can learn (Yin 1994; Stake 2000). The design is not 'full-factorial', as this should not be the goal in this stage of case research. As Stake (2000, p. 6) notes: "Even for collective case studies, selection by sampling of attributes should not be the highest priority. Balance and variety are important; opportunity to learn is of primary importance". The selection criteria are elaborated upon below.

Industries are selected on the basis of their level of government regulation on environmental issues. Government is the most important actor that puts environmental

issues on the agenda of firms (De Groene 1995). Therefore, we can expect most green product innovations to be developed in an environment with considerable regulatory pressure. However, green product innovations can also be developed for other reasons, such as a felt market need. In such cases, strong government intervention could not be necessary. Also, performance consequences could be different in industries with lenient regulation compared to industries with stringent regulation. In industries with lenient regulation, firms could have found the opportunities of developing successful green product innovations by themselves, without the government to show them the way. By only studying green product innovations that have been developed under high regulatory pressure, a systematic bias can be introduced that limits variety. The product innovations that are developed because of high regulatory pressure could be less successful than product innovations that are developed because of other reasons, such a felt market need. Concluding, to avoid the potential bias attached to studying product innovations developed under high regulatory pressure, the case studies will have to include product innovations developed under low regulatory pressure. By controlling for regulatory pressure, it is likely that innovations stemming from different innovation sources are studied.

Table 2.1: Case Studies for the Theory-Building Stage

Industry	Green Products		Control Products		Totals
	Small Firm	Large Firm	Small Firm	Large Firm	
Chemical industry	Bennet (S/F)[a]	Ecocoat[b] (F) Aquacoat[b] (S/F) Topcoat Pro[b] (S)		Topcoat[b] (S)	5
Food industry	Mex-eco (S/F)	Mayonnaise (S)	Piccolo (S/F)		3
Totals	2	4	1	1	8

[a] Letters between parentheses indicate the initial judgment of success or failure of the product; S = Success, F = Failure, S/F = Success or Failure unclear.
[b] Fictitious product names for reasons of confidentiality.

For the reason outlined above, two industries are selected for the case studies with varying levels of government regulation concerning green issues. Case studies are obtained from two industries: the chemical industry and the food industry. These industries represent two quite different positions in environmental government regulation. The chemical industry is an example of a *stringent* regulatory environment. The chemical industry has a long history of regulatory pressure in safety, health, and environmental issues, dating back as far as the publication of Rachel Carson's book Silent Spring in 1962 (Hoffman 1997). The food industry, on the other hand, is an example of relatively *lenient* regulatory environment. It has not witnessed a great deal of regulatory pressure in these issues. Yet there are sufficient reasons to assume that safety, health and environmental issues are at least on the agenda of firms. Stakeholders other than government, such as customers or competitors, will have made safety, health and environmental issues salient enough in order for green issues to have en-

tered the new product development process. Some government interference is present in the food industry. From 1991 and onwards, convenants, voluntary agreements between industry and regulators, aim to reduce the environmental impact of packaging and packaging waste.

Firms are selected based on their size. The notion that innovation is influenced by firm size is forwarded as early as 1912, by Joseph Schumpeter (Schumpeter 1976). The effects of size on innovation have been extensively researched, but the results of these efforts have been mixed (Chandy and Tellis 1998). It is likely that firm size influences the radicalness of innovations (Ali 1994). It can be argued that only large firms can support R&D efforts that are substantial enough to develop radical innovations. However, the counter argument says that only small firms have the flexibility that is needed to develop radical innovations. Moreover, it is very likely that new product development in large firms is organized differently from small firms (Dougherty and Hardy 1996). This could have all sorts of consequences, ranging from the way green issues are included in product development to the introduction strategy used. Whereas the effect of size is not clear and probably mixed, the firms that are selected in the sample must vary in size in order to create balance and variety. Size is operationalized as number of employees, because this is easy to observe. The smallest organizations in the design have approximately 20 employees, the two largest are multinational firms with more than 75,000 employees.

The individual cases were selected on whether green issues were incorporated in the project and on success/failure. To gain some insight in the possible differences between 'regular' and green product innovation strategies, two control products were studied, one in chemicals and one in food. The control cases are products that were reported by the firm to have been developed without taking green issues into account. For these two firms, an embedded design was used, with firms as units, and products as sub-units (Yin 1994), as depicted in Figure 2.1. In these firms, data were collected on more than one product innovation project and general insight was gained on product innovation processes in the organizations. This means that both questions were asked on the organization as a whole, as well as questions on individual product innovation projects.

The last selection criterion is success or failure. The product innovation literature has historically studied both successes and failures, with a bias toward studying successes (Craig and Hart 1992; Montoya-Weiss and Calantone 1994; Balachandra and Friar 1997). The factors explaining failure might be different from the factors explaining success. Researchers studying product innovation performance should therefore study success as well as failure (Craig and Hart 1992). Data gathering on failure is more difficult than on success, because managers are less likely to co-operate, people involved in the failure have a higher likelihood of having been fired and not being accessible for interviewing, or information regarding the failure of product innovation being lost (Montoya-Weiss and Calantone 1994). However, studying the reasons for failure is rewarding because it deals with an extreme end of the innovation performance continuum. This appears to be even more the case for green product innovations, because the trade press as well as informal discussions with managers seem to suggest that many green product innovations have failed miserably. Concentrating the

case studies on successes would limit the variety in the case studies, in that only patterns leading to high innovation performance are studied and understood.

Figure 2.1: Embeddedness of the Theory-Building Cases

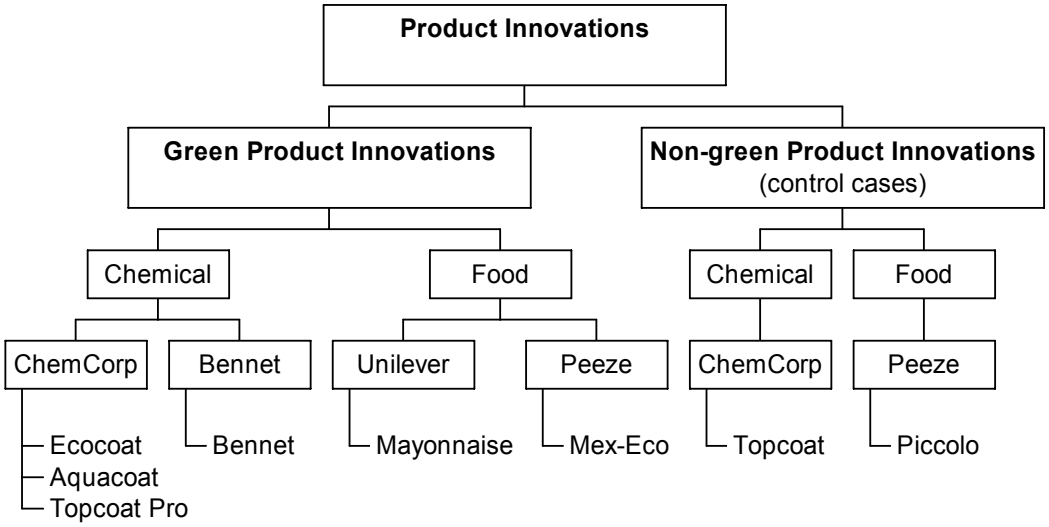


Table 2.1 shows that six green cases and two, non-green, control cases were selected, and that one product was identified *a priori* as a failure, three as success, and with four cases success or failure was not clear beforehand, most likely somewhere in between. It is important to note that this involved no more than a superficial judgment of the cases, based almost exclusively on the assessment of a single initial informant in the organization. Both aspects, the inclusion of green issues in the development project and the innovation performance, are subject to investigation in the case studies. The initial assessments only serve to ensure diversity in the selected cases. In fact, some of the initial assessments of both variables appeared to be not entirely correct after more careful consideration of the data.

The procedure of case selection and gaining access to cases was undertaken in several ways. Most of the organizations were identified by environmental management experts, who were asked to name organizations in the food and chemical industry that had incorporated green issues in the development of some product(s). One organization was selected by the researcher, based on prior visits to the firm for a different purpose, and in one organization an environmental manager encouraged the organization to participate. Cases within the focal organizations were selected by the researcher based on information provided by the initial contact within the firm and as data collection progressed.

Data Collection

Data were collected using two methods: in-depth interviews with key informants and studying documents, thus creating method triangulation (Jick 1979; Eisenhardt 1989; Yin 1994). Key informants were identified by a snowballing method, where each informant was asked to identify other potentially interesting informants (Drumwright 1996). Wherever available and wherever access was granted, informants were inter-

viewed from four domains: marketing, research & development, environmental management, and general management. However, not all firms had these domains as clearly distinct business functions or granted full access to all domains. By investigating multiple domains source triangulation was achieved (Yin 1994). Furthermore, field notes of the interviews were sent to a company evaluator and/or interviewee for corrections and remarks, in order to achieve investigator triangulation (Yin 1994).

The interview guide was a detailed checklist for the researcher with headings that corresponded to the identified constructs from Chapter 1. Each heading represented a research question in this stage. Under each heading a long list of possible probes was listed to allow the researcher to extract a maximum amount of information (Drumwright 1996). Table 2.2 lists examples of probes.

The semi-structured interviews typically lasted between one and two hours. After that, the researcher prepared a written interview report, with key ideas and episodes captured, as advocated by Stake (1995). These case reports were usually between three and five pages long. Interviewees, as well as the liaison at the company, were given the typed interview reports of their interviews. They could comment on these reports, hence ensuring a verification of the data. These member checks, although sometimes without elaborate response, improved the accuracy of the case reports in some cases.

Analysis

The cases were analyzed in five steps. The first step in analysis took place in the case reports, where the topics that had been discussed during the interview were clustered under headings, sometimes irrespective of the chronological order in which topics were discussed during the interview. This step involved only a preliminary ordering of information, avoiding too much interpretation of the researcher. Wherever interpretation by the researcher was involved, this was indicated in the case report as a brief memo (Miles and Huberman 1994). Step two was an early analysis of interviews in case analysis meetings, usually with one marketing professor and one environmental management professor. Case analysis meetings serve mainly to summarize the current status of a case (Miles and Huberman 1994). The third step was a within-case analysis, by developing partially ordered displays (Miles and Huberman 1994). For the most information-rich cases, these displays were fully written case reports, where each variable was described based on all the case reports. In the less information-rich cases, displays were more condensed, grouping key information chunks under construct and variable headings. Step four was a cross-case analysis stage, in which five large, case-ordered matrices (Miles and Huberman 1994) were constructed for market environment, antecedents, product characteristics, introduction, and innovation performance, respectively. Each cell contained the most important information about a variable for a case. The final step employed a pattern matching method (Miles and Huberman 1994; Yin 1994) to allow for cross-construct relationships to be identified.

The level of analysis was the product development project and the resulting product. Some constructs, like market orientation, were originally assessed on business unit

Table 2.2: Summary of the Interview Guide for the Theory-Building Cases

Construct Type	Heading	Example Probes
Environment	Market supply characteristics	How strong is competition in your market?
	Market demand characteristics	Is your market a strong growth market compared to other markets of the organization?
	Role of green issues	Do customers attach great value to green issues?
Antecedents	Customer orientation	Do you systematically collect data about customers (e.g. market research)?
	Competitor orientation	Do you systematically collect data about competitors?
	Technological orientation	Do you have a strategy of being first-to-market with new technologies?
	Green orientation	How important are green issues for the business unit?
	Inter-functional coordination in NPD	How do different departments coordinate in new product development projects?
GPI strategy characteristics	Newness: - of the used technology	- What is the status of the used technology in the scientific community, embryonic or established?
	- for the firm/management practice	- Does the business unit have experience developing and marketing similar products?
	- for customers	- Does the product make any adaptations necessary for users?
	Greenness	Does the product constitute a considerable improvement on green issues, compared to current products in the market?
	Relative advantage	Is the functionality better or worse compared to current products in the market?
	Product cost	How expensive is it to develop products from the used technology?
	Introduction strategy	Is the target group well-defined, and how would you define it?
	Introduction tactics	Can you describe the pricing policy that was followed?
Outcomes	Financial performance	Did the product meet with objectives on margin?
	Customer performance	Did the product manage to gain market share?
	Technological performance	Does the product/technology constitute a long term source of competitive advantage?

level, but it soon became clear there were differences between product development projects within the same business unit. Therefore, analysis was performed on the project level, as much as possible. The time frame of the analyses differed between cases and was guided by flexibility in order to be able to assess all relevant constructs as good as possible. In some cases, a substantial time period was taken into account, because for very new products a longer period is necessary to fully assess the performance of the product (Griffin and Page 1996). As all data collection in case research, analysis was sometimes constrained by access to information or informants. When insufficient information could be collected to reach a reliable assessment of a construct, no assessment was made. In the results tables, the corresponding cells are indicated as '(not assessed)'.

2.2 Data description

The data that were gathered for the theory-building cases are reported in Table 2.3. The extent of data collection differed significantly per firm because data were gathered following Eisenhardt's (1989) principle of flexibility or 'controlled opportunism'. This means that more data on a topic were only gathered if the additional information gained by conducting extra interviews yielded substantial extra insights. Furthermore, access to data was sometimes limited.

Table 2.3: Data Sources in the Theory-Building Stage

Firms	ChemCorp	Peeze	Unilever	Bennet
Cases	3 products 1 control	1 product 1 control	1 product	1 product
Interviews	16 (25.5 hours)	3 (6.5 hours)	1 (1 hour)	2 (5 hours)
Other site visits	7 (8 hours)	2 (3 hours)	2 (3 hours)	1 (1 hour)
Informants	17	4	2	2
Other interview field notes	8	-	-	-
Internal documents	Yes	Yes	Yes	Yes
Public documents	Yes	Yes	Yes	Yes

'Other site visits' are visits to the case site that did not involve formal interviewing with a protocol, field notes or transcription, but that did yield relevant information. This kind of information was useful for understanding the product's technology, understanding a key construct in the study, or observing behavior. For instance, by visiting a customer training center at ChemCorp the technology was seen in action, and was learned how the firm uses this facility to acquaint its customers with using new

products. Other examples of 'other site visits' are formal meetings where the investigator was a non-participant observer or informal meetings where useful information was obtained.

'Other interview field notes' were used in the cases at ChemCorp and involved interviews that were conducted within the context of a related research project. Parallel to the data collection for the theory-building cases, a professor in environmental management interviewed employees within ChemCorp and one regulator relevant to the industry. These interviewed were aimed at identifying possible eco-efficiency improvements in the product chain of the firm. Eight interview field notes of this research project were deemed relevant and used as additional case study material.

The documents acquired for the case studies include 'internal' documents, not available to the general public, and public documents. Internal documents include written strategic plans, market research reports, written guidelines for the sales force on targeting and positioning, and market studies by consulting agencies or interns. Public documents include environmental annual reports, government reports, media clippings, brochures, advertising, etc.

Informants were obtained over three domains: general management, marketing, and research & development (Table 2.4). The environmental management business function was present as a separate entity in the large firms, but was never involved in the product development and introduction activities. Instead, one or more 'environmental champions' (Handfield et al. 2001) from research & development were usually involved in the product development efforts. Therefore, these informants are included in the research & development domain.

Table 2.4: Informants for the Theory-Building Cases

Domain	Chemical	Food	Total
General Management	5	2	7
Marketing	9	3	12
R&D	5	3	8
Total	19	8[a]	27

[a] Two interviews (one with an R&D manager food, one with a senior marketing executive in food) are not part of a full case study but included in this table.

Other interviews

Two other interviews were conducted in the theory-building stage of the investigation. The data collection is insufficient to base a case study on, but the interviews did yield useful information. The interviews lasted approximately 2 hours each, bringing the total interviewing time in the theory-building stage at 42 hours. Both interviews took place in the food industry, one in a large firm, and one in small firm. The green product innovation in the large firm was a failure and was terminated, whereas the two green product innovations in the small firm had not been on the market long enough to tell success of failure. The small firm was a meat processing firm, that was

extending its product range with vegetarian products, one positioned as a green product and the other positioned as a non-green product. The informant was an R&D manager. The large firm was a candy manufacturer, globally active, that had a strong dedication to environmental management in its production processes. The company, however, had not made many efforts at green product-related improvements. It introduced a candy product, that was positioned as green. The green advantage was that for each product sold, the company would donate money to the World Wildlife Fund. The firm acquired a license from WWF to carry its symbol on the packaging of the product. The informant was a senior marketing executive. For both interviews, additional documents were available.

2.3 Case Summaries

Each of the cases will be briefly described, focusing on the antecedents, characteristics, and outcomes of the GPI strategy that was followed. If more than one case was investigated at a firm, the common context of these cases will be described first.

Table 2.5: Descriptives of Cases in the Theory-Building Stage

Firm	Brand Name	Product Description	Major Green Improvement(s)
ChemCorp	Ecocoat	Car refinishing topcoat	Without isocyanates
ChemCorp	Aquacoat	Car refinishing basecoat	Waterborne technology
ChemCorp	Topcoat Pro	Car refinishing topcoat	High-solid dispersion technology
ChemCorp	Topcoat	Car refinishing topcoat	None (control product)
Bennet	Bennet	Recycling agent	Makes recycling of plastics and rubber easier
Peeze	Mex-Eco	Sustainably grown coffee	Sustainably and organically grown, improved packaging, ecological roasting facility
Peeze	Piccolo	Single origin coffees	None (control product) with one Mex-Eco variant
Unilever	Calvé	Mayonnaise	Made from egg-yolk of free-range eggs

Firm: ChemCorp

Four cases are taken from ChemCorp CR[1], a business unit of ChemCorp. ChemCorp, is a large multinational chemical firm, active in pharmaceuticals, coatings, chemicals, and fibers. It was the world's leading producer of coatings. ChemCorp CR marketed coatings for car repair, commercial vehicles and the transportation market and had sales in 1998 of over € 500 million. The origins of this business unit date back to the eighteenth century, as a producer of lacquer for carriages. The business unit has a

[1] Company name, brand name, and all the names of the cases embedded in this company are fictitious for reasons of confidentiality.

long history of technological innovation, especially in its flagship brand Starcoat. It was the first to introduce a new technology generation in 1970, with the introduction of Starcoat Topcoat. This product was the first to use a so-called *2K system*. The *2K* technology became the dominant design and was still used at the time of data collection.

The major environmental problems caused by car refinishes fall into two categories: VOCs and toxicity. VOCs are Volatile Organic Compounds, a catch-all name for a whole range of organic compounds of low molecular weight that are of great concern as pollutants, responsible for much of the ozone present at low levels (Dunlop 2001). Not only do VOCs cause pollution, at the time there were also health concerns regarding the workers who were exposed to VOCs, because prolonged exposure can lead to an array of diseases, including Organo-Psycho Syndrome (OPS). Car refinishes can also contain ingredients with high toxicity, such as isocyanates and heavy metals. At the time of data collection, most environmentally responsive technology in the industry was aimed at reducing VOCs, either by waterborne or high solid systems.

In the market of car refinishes, ChemCorp CR was one of the seven big global suppliers. In its home market, the Netherlands, it was the market leader. However, informants believed that the company had lost its position of technology leader. Customers also perceived that ChemCorp CR was lagging behind competition with respect to technology, especially environmentally responsive technology. The company was late in offering a fully developed waterborne system, in which competitor ICI had taken the lead. Furthermore, ChemCorp CR had problems introducing high solid products to the market in time and it was a follower in offering environmental management services to its customers.

All four cases taken from this organization are products from the Starcoat brand and are coatings used for refinishing cars. These paints are technologically different from the coatings used for new cars by car manufacturers. An unassembled new car body can be heated to high temperatures (between 120 °C and 175 °C) in a muffle stove to cure the coating. Car refinishes, on the other hand, are typically used by car repair shops to repaint damaged cars, which have parts that cannot withstand the high temperatures used in a muffle stove. In professional car repair shops the coating is applied by a spray gun in a spray booth, which sometimes can be heated up to 60 °C to accelerate curing of the coating.

Topcoat (control case)

Topcoat was the world's first 2K car refinishing product. It was a highly innovative breakthrough product, that established an entirely new generation of car refinishes. Being a 2K coating, Topcoat, like other topcoats and clearcoats, consists of separate physical products that need to be mixed in the right ratio by the user before applying. Therefore, Topcoat is not one physical product, but a system of products to be used in conjunction. Before Topcoat, the technologies used were nitrocellulose coatings or alkyd resin coatings, both 1K systems. Topcoat offered significant advantages over the former in gloss and over the latter in speed. Moreover, Topcoat offered improved durability of gloss and color over any existing product. Green issues, like toxicity or

VOCs did not play a role at the development of the product, although health, safety and environment improvements were made in subsequent years. Topcoat is a solid color topcoat, i.e. it is used for refinishing cars that require a single-stage, solid color coating. This is in contrast with two-stage coating, which use a pigmented basecoat and a transparent clearcoat, or multi-stage systems, which use a pigmented basecoat, one or more semi-transparent midcoats, and a transparent clearcoat. The latter two systems are used to create a metallic or pearl effect in the coating. Topcoat was introduced as early as 1970 and still marketed in 1998. The product is included as case study because it is one of the most recent examples of new product development in which green issues were not involved. Although the time elapsed between introduction and data collection is considerable, enough reliable data were collected. One informant was part of the product development project team, and several others were long-time employees who were knowledgeable about the product.

Ecocoat

Ecocoat, like Topcoat, is a solid color topcoat. Like Topcoat, Ecocoat is a 2K car refinish system, which means that it requires a separate base and hardener that are mixed just prior to usage. The vast majority of car refinishes used in the developed world are 2K systems. 2K car refinishing systems contained isocyanates, which are extremely toxic. Ecocoat was a highly innovative product, the world's first 2K car refinish system without isocyanates. It was developed because ChemCorp CR believed that isocyanates would become an issue of concern for customers and that a number of countries would introduce regulation that would restrict or ban the use of isocyanates. This belief was reinforced after the disastrous accident in 1984 at a Union Carbide plant in Bhopal, India, that killed approximately two thousand people through exposure to methyl isocyanate (Graedel and Allenby 1995). Ecocoat was introduced in 1986.

Aquacoat

Aquacoat is a basecoat, used in the first stage of a two-stage or multi-stage coating. Therefore, it is pigmented (colored) and to be used in combination with a clearcoat (the transparent layer). A car repair shop has a choice of which clearcoat to use over a given basecoat. Therefore, the basecoat is treated as a product in itself. The basecoat itself, however, is a system of components. Aquacoat was ChemCorp CR' first waterborne basecoat. This means that the main solvent used is water, rather than VOC solvents. The coating is not entirely VOC-free however, as it requires a VOC-based co-solvent to ensure a good flow of the paint during application. Aquacoat was introduced in 1994, two years after the introduction of the world's first waterborne basecoat by competing paint manufacturer Imperical Chemical Industries (ICI).

Topcoat Pro

Topcoat Pro is a 2K solid topcoat, an 'improved version' of an earlier product of ChemCorp CR. Topcoat Pro had advantages over Topcoat in ease of use, speed, usage costs. It was based on green technology that was developed to create car refinishes with a lowered VOC level. These low-VOC paints were called 'high solids' or

'medium solids' in the market, depending on their VOC levels. Although Topcoat Pro was based on technology for high-solid paints, its VOC level was not necessarily low, because the Topcoat Pro system allowed for different hardeners to be used. The VOC level of Topcoat Pro depends on the hardener that is used. Topcoat Pro was introduced to the market in 1995.

Firm: Bennet Europe

Bennet Europe was established as an inventor's company, to market a chemical agent that can be used as an additive in (recycled) plastics. At the time of data collection in 1998, it was a small company employing 13 people. It operated in technologically complex markets where various parties in the product chain for producing polymers were its buyers. The firm is named after the chemical agent that is the basic technology for all of its products, Bennet. The company was first acquired by DSM, a large chemical manufacturer, who saw in Bennet a possible threat and/or market opportunity. At the time of data collection, DOEN Participations held a majority stake in Bennet. DOEN Participations is a charitable foundation, founded by a national lottery, that acts as a venture capitalist to stimulate projects in the fields of nature and environment, foreign aid, and human rights. The foundation invested funds in Bennet because of the products potential benefits for mechanical recycling of plastics. Bennet marketed the chemical agent to several markets and in different forms: the chemical agent in two different formulations, plastic alloys in which the agent was used, synthetic rubber in which the agent was used, an industrial cleaner based on the additive, and as a masterbatch carrier, a ready-made mixture of chemical additives including Bennet. All these products are in essence, or are derived from, the core technology, being the additive itself. The firm operated from the Netherlands, but had agents and distributors in 22 countries. Bennet's activities were restricted to production of the chemical agent, product development, and marketing. All other activities, such as manufacturing of plastics and rubbers in which the chemical agent had been used, distribution, and sales were outsourced.

Bennet Recycling Agent

Bennet was invented as a binding and moulding agent to improve properties of polymers (plastics and rubbers), particularly mixtures and alloys of different polymers. The main advantage of Bennet is described succinctly in its patent description (European Patent no. 0287140): "[…] to provide a polymer composition capable of enhancing the compatibility and miscibility of plastics with each other, while at the same time, if desired, it may improve a large number of other properties of the plastic." Bennet has been patented in many markets, including the United States and Europe. It has one main application, alloying and mixing of polymers, but many derived applications. One of these derived applications is as recycling agent in both plastics and rubbers. Bennet creates better opportunities for recycling of plastics and rubbers. Although Bennet can also be used for compounding virgin materials, the case study will concentrate on the use of Bennet as a recycling agent. Bennet can improve materials that are a mixture of waste and virgin materials or that consists solely of (mixed) waste materials. Recycled plastics and rubbers have inferior properties compared to virgin materials. Bennet can alleviate these problems. Using Bennet in recycling has

three major advantages: the recycled material has better mechanical properties, better processing properties, and it is possible to use a low-cost mixture of polymers (including waste materials) that has similar properties to a more expensive mixture of polymers. Bennet recycling agent was sold in several varieties that differed slightly, in that they were optimized for use in different mixtures of polymers.

Firm: Koffiebranderij Peeze

Koffiebranderij Peeze (hereafter: Peeze) started as a family business in 1879. In 1999, it was a small firm, employing approximately 30 employees. The firm marketed primarily coffee and coffee making equipment to the *out-of-home* market: cafés, restaurants, hotels, and for work place consumption in companies and institutions. Peeze had a market share of 1-2 percent in the out-of-home market. It strived to deliver a full-range concept, including supplementary products such as tea, sugar, milk, and cocoa. The firm operated in the high-end niche of the coffee market, in which it claimed to be the market leader. Peeze had a strong dedication to product quality. It devoted a lot of energy in procuring shipments of highest grade coffee beans and stimulated its employees to engage in regular tasting sessions. Informants at this site invariably were coffee enthusiasts, and all stressed that the most important norm within this organization was that quality should never be compromised. As one informant explained: "we always go for quality, even if it cuts in our margins." Peeze also has a history of innovation: in the 1950s it installed a then-state-of-the-art roasting equipment and it claims to have been the first company in The Netherlands to roast espresso. It aims to be one of the most innovative companies in the Dutch espresso market. The company was a frontrunner in pro-active environmental management. It received two local awards for environmental excellence and a special recognition by the Dutch national government, listing it as an 'environmental success' (Ministerie van VROM and Ministerie van EZ 1995). By a complete redesign of the coffee roasting process, Peeze succeeded in reducing water consumption by 99%, virtually eliminating the emission of odorants, and increasing its energy efficiency by heat recovery. Environmental management extends to all business activities: the sales force for instance has on-board computers that register whether the sales reps have a fuel-efficient driving style. After initiating green process improvements, the firm directed its attention to its products, reducing the amount of aluminum in its packaging, and introducing a coffee produced from organically grown coffee beans, called Mex-Eco.

Mex-Eco

Mex-Eco is a coffee with both a social responsibility certification (Max Havelaar) and an environmental certification (EKO). Max Havelaar is a fair trade certification for sustainable production, trade, and consumption. The Max Havelaar Foundation certifies producers and traders who purchase their raw materials from registered co-operatives of small farmers and plantations. The certification aims to ensure that farmers and plantations in developing countries receive a higher price for their produce and that the produce is manufactured in a more socially and environmentally responsible way. Peeze was one of the many license holders of the Max Havelaar trademark. The EKO trademark is a certification for organic production. It is issued

by an government-recognized inspection body, SKAL, that certifies that the raw materials are from organic suppliers, who do not use chemical or synthetic pesticides. Mex-Eco was introduced in 1993, and at the time was the first and only coffee brand in the Netherlands with both certifications. Peeze tried to have an integral green approach to this product: "everything has to be right" was the mantra that all informants used to describe the efforts in greening Mex-Eco. Therefore, a new packaging was developed to reduce environmental impact: a reusable plastic five-liter bucket. Mex-Eco has different grinds and roasts, such as café filtré and espresso.

Piccolo (control case)

Peeze Piccolo was introduced in 2000. The product is a 'pad', a quantity of coffee for one serving, that can be used in semi-automatic coffee makers, which many restaurants, hotels and cafés use to brew their coffee. The coffee in the pads is coffee of a single origin, allowing the customer to choose the region of origin of his or her coffee. Coffee is a product with many varieties and coffee beans of different regions have different tastes. Piccolo has four varieties: Kenya, Colombia, Sumatra, and Mexico. By including Peeze Piccolo in their assortments cafés, restaurants, company cafeterias etc. can offer a gourmet coffee to their customers. The technological innovation is in the pads, that are produced and filled for Peeze by a Belgian supplier. Coffee roasting for Piccolo is done in the Peeze production facility, because, according to an informant, "that is a part of the process that we absolutely want to have control over". The Mexico variety is marketed with both the Max Havelaar and EKO certifications, but the other three varieties have no green improvements except that the coffee is roasted in Peeze's standard environmentally improved production facilities. Relative to Mex-Eco, these three varieties are non-green product innovations within Peeze. Therefore, they serve as a control case within Peeze to contrast green product innovation with non-green product innovation.

Firm: Van den Bergh Foods

Unilever is a large multinational corporation, headquartered in the Netherlands and in the United Kingdom. It manufactures fast-moving consumer goods, mostly foods and products for home and personal care. Unilever in 1998 – the year of data collection – had some 500 operating companies in over 80 countries, approximately 300,000 employees, and a total turnover of € 40.4 billion. It has a long history of developing and launching new products in these product categories. Moreover, it has often been quoted as a firm with a long history of market orientation, being one of the pioneers of marketing branded products in Europe and marketing research. The case study is taken from its division Van den Bergh Foods Nederland, which marketed several leading brands of food products in The Netherlands including margarine, ice cream, sauces, meat products, and frozen vegetables.

The environmental policy of the organization was aimed at combining economic growth with sound environmental management. At the time of the case study, the corporation was a strong believer of a multi-brand strategy with no corporate endorsement brand. Most of the communication about green issues was on a corporate level rather than a brand level. Because of the multi-brand strategy the company em-

ployed, corporate communication could be relatively isolated from brand communication. As a consequence, while corporate communication did pay attention to green issues, brand communication very rarely mentioned any green issue. Very few brands were positioned as green, although throughout the world some brands or products had been positioned as somewhat 'green' (for instance in Austria).

Calvé Free-range Mayonnaise

Calvé was one of the leading brands of mayonnaise in The Netherlands. In 1995, the business unit introduced a mayonnaise produced from egg-yolk of free-range eggs, to replace its existing product made from regular eggs. Egg-yolk is a important ingredient in mayonnaise, accounting for approximately 8% of the volume. From a green perspective, the advantage of free-range eggs over regular eggs, is improved animal well-being of the poultry. At the time, free-range eggs had become popular in The Netherlands. This had prompted a marketing employee to raise the idea to use free-range eggs for the product, which was experiencing considerable market pressure at that time. Subsequent market research showed that consumers were positive about the new product idea. Supply of free-range eggs was found to be sufficient for mass production of mayonnaise. Raw material costs, however, are higher for free-range eggs than for regular eggs. The improved product was launched, stressing the fact that it was made of free-range eggs. No other major changes were made to the product or its marketing mix in comparison to the previous version.

2.4 Market Environment

The market environment in which the product innovations were introduced provide a context that makes it easier to understand why products were introduced, the characteristics of the products, their introduction, and ultimately, why they became successful or not. Market environment is described by four characteristics, as introduced in the preliminary research framework in Chapter 1. *Supply characteristics* describe the intensity of competition and general supply structure of the market. *Demand characteristics* describe the development in market volume, general structure, and major trends concerning the buyers in a market. *Market position*, although not included in the original research design, emerged as a possibly important construct to understand the GPI strategy. Informants often referred to the market position of the firm to explain various aspects of GPI strategy. The *importance of green issues in the market* is the fourth characteristic to depict the environmental context.

Table 2.6 summarizes the most relevant findings on environmental context. Please note that, although some products were introduced essentially in the same market, market environment can change over time, thus leading to dissimilar assessments for the same market.

Because the products at ChemCorp CR span a long period, the market environments in which they were introduced vary considerably and warrant special attention. One aspect of the market that informants invariably referred to is the degree of professionalism of customers, the car repair shops. In 1970, when Topcoat was introduced, the

Table 2.6: Market Environment

Case (Year of intro)	Supply Characteristics	Demand Characteristics	Market Position	Importance of Green Issues in Market
Topcoat (1970)	Not very competitive market, with many local small suppliers	Growing market, with many unprofessional buyers	Minor player	Very low, negligible awareness of toxicity and VOCs
Ecocoat (1986)	Competitive market, with few large suppliers	Stable market, with some professional buyers	Technology leader	Low, but increasing attention for health, safety, and environmental issues
Aquacoat (1994)	Competitive market, with aggressive promotion, decreasing number of suppliers	Stable market, with increased competition among more professional buyers	Major player	Moderate, awareness of waterborne technology, VOC regulation expected
Topcoat Pro (1995)	Competitive market, with aggressive promotion, decreasing number of suppliers	Stable market, with increased competition among more professional buyers	Major player	Moderate, awareness of waterborne technology, VOC regulation expected
Bennet (1989)	Increasingly competitive market	Growing niche in complex market	Niche player	Moderate, awareness of polymer waste, isolated initiatives from processors
Mex-Eco (1993)	One dominant supplier, few small niche players	Declining market, with increased variety seeking	Niche player	Low, with emerging niche for sustainable products
Piccolo (2000)	One dominant supplier, few small niche players	Declining market, with increased variety seeking	Niche player	Low, with small niche for sustainable products
Mayonnaise (1995)	Very competitive, competition by store brands and discount brands	Stable market, with increased health awareness	Market leader	Low, only awareness of packaging waste, and high acceptance of free range eggs

market consisted of many small repair shops that were relatively unprofessional in equipment and operations. In fact, the introduction of Topcoat as the first 2K system brought about a revolutionary change: car sprayers received formal training, repair shops started to invest in spray booths, and were able to dramatically increase their production. On a global scale, ChemCorp CR was a minor player when Topcoat was introduced, but it developed into a major player because of the product. It gained the reputation of the most innovative company in the market, to a large part due to Top-coat. The common language used by the informants within the firm to describe this position was ‘technology leader’. It was the feeling of all informants that ChemCorp CR had slowly lost the position of technology leader, as it failed to be a frontrunner in developing ‘green’ waterborne technology. Documents, more specifically market re-search, corroborated that customers felt the same way.

Many informants were very aware of the role of green issues in the market and elaborated on it. In none of the cases green issues were of great importance when the product innovations were introduced. Many informants were even outright skeptical about green demand from buyers in most markets. Says one informant from ChemCorp: "I have never come across a car repair shop owner that is genuinely concerned about emissions." Similarly, an informant from Bennet remarked: "The [polymer processing] industry doesn't really care about green issues. When General Motors starts a recycling program, they do so because they think it will be profitable."

Although none of the markets showed sizeable green demand at the time of introduction, green niche markets were observed. Niche markets for waterborne car refinishes and recycling additives were nascent, whereas in the coffee market a niche for social responsible (Max Havelaar) coffee was emerging, as well as a smaller niche for ecologically grown coffee. Moreover, in the Mayonnaise case, the presence of a more or less green mass market in a related product category spurred the product development idea. The market for free range eggs had seen 40% market share growth between 1990 and 1995. This caused people in the firm to consider using free range eggs for mayonnaise as well.

Although green issues did not materialize in large green buyer demand in any of the studied markets, green issues were of moderate importance in some markets. As can be observed from Table 2.6, green issues were moderately important in the markets for chemical products Bennet, Aquacoat, and Topcoat Pro, all introduced in or after 1989. The drivers behind the increased role for green issues in the chemical industry appear to be general public interest and, particularly, regulation. Especially in the car refinish market, regulation has a dramatic impact. At the time of data collection, regulation limiting the VOC level of car refinishes was already in place in the UK and California, thus banning a considerable part of the product range of ChemCorp CR. Both informants and written sources predicted new regulation concerning VOCs to be instated by European and North-American transnational, national and local regulators. At the time of data collection, VOC regulation was a priority management issue in the car refinish industry. In the Netherlands, an important market for ChemCorp CR, regulation that would compel car repair shops to use only low-VOC products was already announced. At the time of data collection, the importance of green issues in the market could already be classified as high. At the times that the products from this industry were developed, this was not yet the case however.

In the markets for food products that were studied, green regulatory issues were of little importance. The most important green regulatory issue in the market was the packaging covenant that the Netherlands government reached with the industry to reduce packaging waste. This did not have an impact on the product development of the mayonnaise. In the case of Mex-Eco, a greener packaging was developed, but informants quoted reasons other than the packaging covenant, such as a felt market need and the desire to develop a product with minimum environmental impact.

2.5 Antecedents

Possible antecedents identified during the in the preliminary research framework in Chapter 1 include customer orientation, competitor orientation, inter-functional coordination, technology orientation, and green orientation. The first four antecedents are related to market orientation, or in the case of technology orientation, lack thereof. Green orientation was found to be a multidimensional construct during the fieldwork and subsequent analyses and is reported separately and in more detail.

The antecedents relating to market orientation are reported first and summarized in Table 2.7. The analysis of market orientation presented in the table is performed on the level of the individual product innovation projects, rather than at the business unit or firm level. The initial data were analyzed on a business unit level. In most interviews, however, informants elaborated about sources of the innovation project, such as specific information about customers, a competitor's action, or expected regulation. When asked to describe the innovation projects, most informants talked about information that had led to the project, or that was collected or used during the project. This yielded more detailed information than just firm level market orientation. Therefore, during the data collection, the focus of the interviews gradually shifted to collecting data about the orientations during the product innovation projects. This appears to be a fruitful approach, because it allows for the observation of differences in market orientation between products that were developed in the same firm.

The table shows that two product innovations were developed based on information about customers that proved to be inaccurate. The case studies of these two products, Topcoat and Ecocoat yield insights on what a low market orientation in product development entails. The case study of a third product, Aquacoat, yields insights on the partial accuracy of market information.

Topcoat was based on the false assumption that buyers wanted a car refinish that would keep its gloss. The technologies that were used before Topcoat shared one problem: the gloss of the paint would fade eventually, exposing a difference between the refinished car parts and the parts that still had the original layer of baking enamel which *does* keep its gloss. It was felt by ChemCorp CR that the fading of gloss was a problem, and to solve it, it developed Topcoat. Soon after being introduced to the market, Topcoat proved to be a success, but not because of the durability of the gloss, but because of its time-saving qualities and appearance (invisibility of repairs). Car repair shops did not particularly care about the visible difference with the original baking enamel. The difference would only appear after the car had long been returned to its user. The informants agree that Topcoat is an example of a successful technology push product. Its development was based on a false assumption about buyer needs and completely technologically oriented.

Ecocoat was developed on the false assumption that the reduction of isocyanates in paint products would soon become a major issue of concern for both users and regulators. Professional customers however, were protected against isocyanates through

Table 2.7: Market and Technology Orientation During Product Development

Case	Customer Orientation	Competitor Orientation	Inter-functional Coordination	Technology Orientation
Topcoat	Low, developed on a false assumption about customer needs	Low, was ahead of competitors	(not assessed)	Very high, aimed at solving a problem that was not important for buyers
Ecocoat	Low, developed on a false assumption about customer needs	Low, underestimated competitor reaction	R&D leading, highly politicized	Very high, frequently labeled as prototypical 'technology push'
Aquacoat	Moderate, but did not recognize reputation effect in time	High, was response to competitor's product	R&D leading	Moderate, aimed at acquiring competitor's technology
Topcoat Pro	Moderate, early customer testing	Moderate, aimed to close emerging gap with competitors	R&D leading, but some marketing influence	Moderate, main goal was technical update
Bennet	Low, insufficient insight in customer needs	Low, unclear who is a competitor or a buyer	R&D only, later some marketing involvement	Very high, technology was pushed as recycling agent
Mex-Eco	Low, 'trial and error', based on gut feeling	Low, 'we are self-willed'	Few functional boundaries	High, focused on finding technical solutions
Piccolo	Low, 'trial and error', based on gut feeling	Low, 'we are self-willed'	Few functional boundaries	High, availability of technology was main driver
Mayonnaise	High, crucial role for market research	High, defensive move against store and discount brands	Marketing leading	Low, little technology involved

mouth caps or protective masks, because they had taken the warnings of the car refinish industry seriously. Therefore, the issue of isocyanates was not a big problem to them. Less professional customers however, generally did not use any protective equipment but did not care enough about the toxicity of isocyanates to switch to Ecocoat. "The market did not know they wanted this product", as a marketing executive remarked rather cynically. Furthermore, because competitors did not have access to technology that would allow them to develop isocyanate-free car refinish they disparaged the product and managed to convince customers it was a bad product. A senior management informant admitted that this competitor response could have been anticipated. In retrospect, he contended, it would have been better to license the technology and thus allow one or two competitors to develop a car refinish without isocyanates. The failure of Ecocoat became a politicized issue between R&D and marketing. At the time of data collection, 13 years after the introduction of Ecocoat, R&D informants and marketing informants were still blaming each other for the fail-

ure. Most informants however, R&D included, agreed that Ecocoat was a 'technology push' product, and some quoted it as the quintessential proof of how technology-driven ChemCorp CR was in the past. It has been suggested that Ecocoat was a political project, advocated by one or a few people who were blind for the risks it entailed.

With Aquacoat, ChemCorp CR did read manifest customer needs correctly. Only a very small segment of customers actually wanted to *buy* waterborne paint, but the firm failed to recognize a latent need among a much larger group of customers. Many of the customers wanted to buy paint from a company that *knew how to make waterborne paint*. Being a leader in waterborne technology acted as a cue for technological leadership for many customers. Therefore, not investing enough money in the development of a waterborne product, caused an unforeseen negative reputation effect.

Table 2.7 shows that the products that are developed from a high technology orientation have a low customer and competitor orientation, and vice versa. Technology orientation appears to have a near-perfect negative correlation with customer and competitor orientation. This brings up the question whether the concept of technology orientation in new product development is redundant. From a theoretical perspective, it is possible that a firm develops a product from a high customer and competitor orientation, and has a strong orientation on technology at the same time (Gatignon and Xuereb 1997; Han et al. 2001; Kok 2003). The data in the case studies do not show such a combination of orientations.

Few products in the case studies were developed with a high customer and competitor orientation. Yet, there is some variation among cases. On the one end, Mayonnaise was developed with a high market orientation. Market research played a crucial role in the development of the product, especially whether customers associate eggs with mayonnaise and whether they accepted the use of free-range eggs as ingredient for mayonnaise. Also, because the brand was under pressure from competing brands, the firm was looking for a way to generate more customer value than competitors. On the other end are Mex-Eco and Piccolo, both developed by Peeze. Both products were developed based on no more than a 'gut feeling' with little attention for customers nor competitors.

Variation in market orientation between product innovation projects in the same business unit can be partly attributed to changes in market orientation over time. Topcoat (introduced in 1970) was developed in the same business unit, but with a lower market orientation than Topcoat Pro (introduced in 1995). The data about Aquacoat and Topcoat Pro suggest however that differences can also occur between product innovation projects that were developed not long after each other. Therefore, changes in market orientation over time can probably not fully account for variation in market orientation between product innovation projects.

Although the final analysis is performed on the product innovation level, some informants did make remarks about market orientation in product development on a more general level. In fact, informants at two firms explicitly mentioned that they did not consider their business unit or firm to be market-oriented. Because the market orien-

tation in product development on a more general level is likely to be related to the market orientation in a specific product innovation project, information about the former is valuable for understanding the latter.

At the time of data collection, ChemCorp CR had a project in place to improve market orientation in new product development. All informants at the site were aware of this project and mentioned how the business unit endeavored to make product development more 'outside in' instead of 'inside-out'. By this terminology they were referring to what was perceived as the past of product development in the business unit in which technology was the main driver of product development, and how this was undesirable. Observations during the interviews corroborated that the business unit had indeed been lacking a customer orientation in product development. First, the generation of intelligence about customer needs, especially the priorities in customer needs, was still in its infancy. There was no systematic monitoring of customers in order to identify opportunities for new product development. The first market research projects by external agencies were committed in 1998. Second, the market information that was collected, was not always of good quality and was not always used. The business unit did have customer intelligence generation, mostly through its extensive sales and service force, as well as competitor intelligence generation, mostly through a divisional market intelligence center. Yet, several informants indicated that the information was not always reliable and structured, and lacked depth. Therefore, informants found it difficult to develop adequate responses to that information. A senior marketing executive remarked: "We get lots of information in. The problem is just how to evaluate it."

Informants at Peeze also hinted at a low market orientation in product development. First of all, the company had its own agenda, in that they had a strong dedication to product quality, irrespective of how customers evaluated quality, and its ecological principles. These business principles often dictated product development, over market considerations. Elementary intelligence collection only started recently, during the time of data collection. The firm commissioned some ad hoc market research to students, and started to build a sales information system. One informant described the firm as a production-oriented company, and how the firm was undergoing change: "Production-wise everything is top of the bill. On the sales side not a lot of things have been done. Since [new commercial director], who has a really commercial attitude, took over, things are really changing over there."

The analysis of inter-functional coordination in the cases reveal differences in the role that the R&D and marketing functions played in the product development process. In the informants' answers, inter-functional coordination was not directly linked to information collection and use, but used to characterize the product development process. R&D and marketing were sometimes identified as two business functions that had conflicting views and interests concerning green and other issues. Table 2.7 shows that R&D was leading in development projects in the chemical industry. This could be related to the high-tech nature of the industry, which has led to a greater investment in technical employees over marketing employees. Observations from ChemCorp suggest this: R&D informants were often highly educated, often at Ph.D. levels, whereas some marketing informants were educated below university level.

Some marketing informants complained about the lack of power they experienced within the organization. In the food industry, marketing was leading the product development process in the case of Mayonnaise, and the absence of functional boundaries point to high inter-functional coordination in the Mex-Eco and Piccolo cases.

Table 2.8 reports the results concerning green orientation. The preliminary research framework in Chapter 1 proposed green orientation as a single construct. During the data collection, it became clear that green orientation really consists of three distinct constructs: the green general company policy, the collection and use of information about green issues in product development, and the priority that green issues received during the new product development process. As the table shows, these three dimen-

Table 2.8: Green Orientation and Stakeholder Roles

Case	Green Orientation			Stakeholders that Played a Role [a]
	Green Company Policy	Green Information Collection and Use in Project	Priority of Green Issues in Project	
Topcoat	Moderate commitment, good citizenship	(not assessed)	None	Supplier of raw materials
Ecocoat	Moderate commitment, good citizenship	Information about regulation turned out to be unreliable	High, goal was to eliminate isocyanates	Regulators
Aquacoat	Moderate commitment, strategy was aimed at less green technology	Reverse engineering competitive product	High, goal was to develop green technology	Fleet owners Insurance companies Car manufacturers Regulators
Topcoat Pro	Moderate commitment, strategy was aimed at less green technology	Information that product would not be compliant with future regulation	Low, functionality more important	Regulators
Bennet	(not assessed)	No reliable information how regulation would develop	Low, application as recycling agent emerged later	Majority shareholder
Mex-Eco	High commitment, implemented integral chain management	Gut feeling	Very high, all aspects of the product chain	Distributor (caterer) Firm owner
Piccolo	High commitment, implemented integral chain management	None	Low, was not a goal	Firm owner
Mayonnaise	Moderate commitment, some green process innovation	Information about customer acceptance of free-range eggs	Low, focused on one raw material with small improvement	Consumer association Animal rights group

[a] Stakeholders other than customers and competitors

sions are independent; none of the three columns under green orientation is adequately explained by one or two other columns.

Green company policy refers to the level of commitment a firm shows in its values, norms, and management practices to initiatives to limit environmental impact of the firm. The analysis shows that Peeze (Mex-Eco and Piccolo) had a high commitment to green issues, whereas the other firms had only moderate commitment. Peeze's high commitment to green issues is shown especially in the integral approach it takes to environmental management. The company has received awards for exemplary environmental management. Green company policy at Bennet cannot be reliably assessed from the available data, although the data give some clues that the firm had a low commitment to green issues when Bennet was developed as recycling agent.

Commitment to green issues is found to be a dimension that cannot directly be linked to a single product development project, but that describes part of the context in which the product development took place. In some cases it explains why some companies develop a green product, even if the company has no information that such a product will be received favorably in the market. Mex-Eco is such a product, developed only on a 'gut feeling' that there would be a market for it, but more so because "it made the green picture complete". The company invested in green process technology, and it seemed only logical from this high commitment to extend its environmental management approach to a new product. More evidence of the role that green company policies have on the development of GPIs was found in one of the interviews that was not part of a full case study. The firm was a large size food company that had a strong dedication to environmental management in its processes, e.g. installation of photo-voltaic solar energy systems at it production facilities. The informant attributed the origin of this high level of green commitment completely to the founder and CEO of the company. In fact, the 'green company policy' dimension appears to be well described by the commitment of top management. In the case of Peeze, it was the company owner, who was also a member of top management, who instigated the company's green policy. Likewise, ChemCorp CR's moderate environmental commitment can also be attributed to its top management, who explained during an interview that green issues were not in the core of its strategy, simply because its main stakeholder, the board of management of the parent corporation, did not set green targets in addition to financial targets, nor allocated budgets for green investments. The business unit, however, had an established tradition of 'good citizenship' and acting more responsibly than its competitors. Informants provided several examples of this good citizenship in the past.

The two other dimensions of green orientation are linked directly to the particular product development projects. The first product development-related dimension of green orientation is the *collection and use of information about green issues in product development*. The analysis reveals considerable differences in the collection of high quality information. Most of the projects did not collect or use high quality information, i.e. reliable information that allowed the firms to develop products to match the future role of green issues in the market. This is particularly visible with Ecocoat, where information was available that regulation in Scandinavian countries would be the first to ban isocyanates from paint, and regulators in other countries

were expected to follow. Regulation, however, did not develop this way. In the case of Aquacoat, the most important information was obtained by reverse engineering a waterborne product of a competitor, who introduced it in 1992. Prior to that, ChemCorp CR had always worked on the assumption that no firm in the industry would introduce waterborne car refinishes because they were considered inferior. This assumption proved to be quite wrong.

On the other hand, two product development projects had access to collected information that proved to be reliable in the future. In the case of Mayonnaise, information about customer acceptance of the use of free-range eggs in mayonnaise turned out to be valuable. In the case of Topcoat Pro, reliable information about green issues was also available, but not acted upon. The business unit knew that the product would not be compliant to future VOC regulation in a number of markets, yet it chose to develop the product nonetheless, partly for markets where regulation was lenient. In this case the green company policy can account for this. The green company policy had resulted in a strategy focusing on high-solid dispersion technology, with waterborne technology only as a second and less important track. Informants used the term 'two-track policy' and this policy was also communicated to customers in documents. Topcoat Pro was based on high-solid dispersion technology, and thus fit in the strategy regarding green technology.

The results show that there is an overlap between customer orientation and the collection and use of information about green issues in product development. To the degree that information is collected about green issues about consumers, it is a specific form of customer orientation. To the degree that information about green issues is collected about competitors, it is a specific form of competitor orientation. To the degree that information is collected about green issues about regulators, it is a construct analogous to customer orientation, like a 'regulator orientation'. Green information collection and use is a construct that is similar to market orientation that shows the relevance of monitoring a wider set of stakeholders than customers and competitors alone, particularly regulators.

The second product development-related dimension of green orientation is the *priority that green issues received during the new product development process*. Again, the analysis shows considerable difference between the cases. This is not surprising because two 'non-green' control products were included as case studies. For both control cases, however, the data show that green issues *did* play a role, albeit small. Priority to these issues was very low, though. Conversely, for some of the products that were identified a priori as 'green', the story is much more complex.. Bennet was originally developed as an additive to improve the compatibility and alloying of different polymers, until the firm found a green application of the technology, i.e. mixing recyclates. Also, informants for Topcoat Pro invariably pointed out that a green product could have been developed, but that this would have hurt functional characteristics. The decision was made not to sacrifice functionality for greenness. The case of Mayonnaise warrants some explanation, too. The only goal of the project was to replace egg-yolk from regular eggs by egg-yolk from free-range eggs. However, this was not seen as a an exclusively green issue: the main goal was to improve perceived product quality of the mayonnaise by using free-range eggs. Furthermore, the only

green issue that is improved by using free-range eggs is animal well-being. Other environmental impacts, such as ammonia emissions of poultry farming, were no issue. Mex-Eco, on the other hand, was developed from an integral approach, where all green aspects from raw material production to waste were taken into account. Informants used the term 'integrated chain management' for this approach (see also Cramer 1996).

Related to the priority of green issues is the way green issues were integrated in the development process. Van den Bergh Foods and ChemCorp CR were the only two firms to have a dedicated environmental management function within the organization. These employees had little impact on product development though. In the cases where priority of green issues was high, the environmental issues were specified as project goals. In the case of Mex-Eco, there was no environmental management function within the firm, but rather an 'environmental champion' who scrutinized green issues (see also Handfield et al. 2001).

Finally, the results show the importance of various stakeholders. When explaining the reasons why green product innovations were developed, informants sometimes referred to stakeholders other than customers or competitors. Re-analysis of the case database revealed that in each of the cases, additional stakeholders could be identified that played a role in the new product development project, especially with respect to green issues. Green issues were often incorporated because of these stakeholders, so they seem to play an important role in GPI strategy. The roles these stakeholder fulfilled were quite dissimilar, in the timing when they exerted their influence, as well as the impact. With regard to timing, the results show that influence of stakeholders can be recognized anywhere in the new product development process, ranging from the very front end of new product development to well after the product has been formally introduced. Examples of influence at the front end are Mex-Eco and Ecocoat. The idea for the packaging of Mex-Eco was spurred by a question from a catering company during an industry meeting why all coffee manufacturers supplied their coffee for large users in 500 gram packages, rather than a larger size packaging. Ecocoat was developed to great degree because regulators were expected to ban isocyanates. Topcoat is an example of a stakeholder role at the end of the process. After the introduction of Topcoat, the business unit realized that the resin contains a high percentage of monomer isocyanate, which is even more toxic than polymer isocyanate. The business unit worked with the resin supplier to reduce the percentage of monomer isocyanate, from a sense of corporate citizenship.

2.6 Product Innovation Characteristics

The eight cases in this chapter show many differences. The product innovations are described using the four characteristics identified in the preliminary research framework in Chapter 1: greenness, newness, relative advantage, and product cost. Table 2.9 provides an overview of the results.

Table 2.9: Product Innovation Characteristics

Case	Greenness	Newness			Relative Advantage	Product Cost
		Newness to the Industry	Newness to the Firm	Newness to the Customer		
Topcoat	Low (control case), but reduced monomer isocyanates soon	Very high, only used in aircraft coating, 'breakthrough' for car refinish	High, much R&D effort & budget, new manufacturing technol.ogy	Very high, required mixing and different application	Very high, increased profitability of car repair shops	High, variable: resin 4 to 5 times more expensive
Ecocoat	High, resin contains no isocyanates	Very high, several patents	Very high, much R&D effort and budget	Moderate, works faster than existing products	Low, mediocre product	High, fixed: R&D costs
Aquacoat	High, favorable life cycle analysis (low VOC)	Low, technology developed by competitor	Very high, much R&D effort & manufacturing problems	High, requires new equipment and training	Moderate/Low, mixed bundle of advantages and disadvantages	High, fixed: R&D costs, manufacturing
Topcoat Pro	Low, slightly better than Topcoat and less than high-solid product	Low, based on existing technology	Low, improved version of existing product	Low, 'idiot proof" product	Moderate, many small advantages	Moderate/High, fixed: color development; variable: material cost
Bennet	High, enables plastic recycling and rubber recycling	High, patented	(not assessed)	High, requires logistic reorganization and new equipment	Moderate/High, better and cheaper recycled polymer blends	High, variable: manufacturing costs
Mex-Eco	Very high, material replacement, energy efficiency, sustainably grown	Moderate, only manufacturing process was new	Moderate, integral chain management and different sales approach	Moderate, bucket requires different handling	Moderate, bucket easier to handle, social responsibility	Very high, variable: high grade coffee, certification fees and prices
Piccolo	Moderate (control case), except Mexican variety: Moderate/High	Low, technology used by competitor	High, unable to manufacture and different sales approach	Moderate/High, requires waiters' promotion and extra handling	Moderate, variety in assortment and less perishable	High, variable: high grade coffee, pads
Mayonnaise	Low, small improvement in animal well-being	Low, minimal changes to existing product	Low/Mod., external certification and different purchasing	Very low, no discernable difference	Low, similar product with 'quality ingredient'	Moderate, variable: raw materials more expensive

Greenness of products is notoriously difficult to assess. The most commonly advocated approach to determine the greenness of a product is life-cycle analysis (Graedel and Allenby 1995; Fuller and Ottman 2004). Life-cycle analysis is a method to quantify the environmental impact of a product, from "cradle to grave". A life-cycle analysis is only available for one of the case studies, Aquacoat. But even a life-cycle analysis cannot give definitive answers about the greenness of the product. Informants in the Aquacoat case pointed out that the life-cycle analysis approach that was used did not take certain aspects into account, most notably human toxicity. In fact, life-cycle analysis is a method with many unresolved problems (Ekvall 2002), that is sometimes even highly criticized (Fuller 1999, pp. 65-67). Even if life-cycle analyses were available for all cases, comparing the eight products on their environmental impact would still be thorny. The base of this problem lies in the fact that each product has many green aspects, such as energy use, human toxicity, and impact on animal well-being, to name just a few. These aspects are difficult to quantify and, most importantly, difficult to compare.

Therefore, a less holistic perspective is applied in the analysis of the greenness of the products in the case studies. The products are compared only on those green aspects in which products that are available in the market have realized improvements or in which improvements are technologically feasible, and that are thought to be important. In this way, only green aspects that have received attention from R&D and environmental engineers are taken into account. The underlying assumption is that these green aspects are the most important, both in terms of environmental impact, and in the available opportunity to improve the aspects. In the case of car refinishes, for instance, green aspects that were taken into account are VOC level, energy use in application, and toxicity. In the case of coffee, for instance, these aspects are different: sustainable production of coffee beans, energy use in production, and packaging. During the interviews, informants were asked to make a subjective assessment of the greenness of the product. The responses of the informants correspond to the above method: most informants focused on the major green aspects of the product category.

Following the selection of major green aspects, a qualitative assessment is made on each aspect, as far as the data allowed, involving two steps. First, all improvements on the selected green aspects of each case are identified based on the interviews and available documents. Second, these ecological improvements are compared with the available information on the green aspects of other products, both of the case study firm and competing firms. If a product's improvements on the selected green aspects represent the 'Best Available Technology' (Ulhøi 1997) the greenness is assessed as 'very high', as is the case with Mex-Eco. Mex-Eco was at the absolute forefront of improvements on the major green aspects. If a product involved a small improvement on only one aspect, its greenness is assessed as 'low'. For instance, Topcoat was assessed as 'low' because it did not offer improvement on major green aspects against existing products, even if the small improvement that was made later (reduction of monomer isocyanate) is taken into account. Intermediate positions were assessed accordingly, with equal weight for the selected major green aspects.

The two control cases, Topcoat and Piccolo, are selected as non-green products. The products were identified by the two firms as products that were developed without

particular attention for green issues. In the case of Topcoat, the analysis shows that the product is indeed low on greenness, because no improvements on green aspects were made compared to other products employing the older technologies. In fact, the use of 2K technology introduced toxic isocyanates into the dominant design in the product category. Soon, the firm worked together with the supplier of the resin to reduce the percentage of monomer isocyanate, because monomer isocyanate is extremely toxic compared to polymer isocyanate. In the case of Piccolo, the product is assessed as 'moderately' green, even though green issues did not receive particular attention. The pads that are used in this product, and especially the aluminum packaging of the pads, make that the product is comparable to most products in the market on the aspect 'packaging'. Most products in the product category used aluminum packaging, which has a high environmental impact. However, the firm chose to have the coffee for the product to be roasted in the firm's own state-of-the-art energy-efficient production facilities rather than to outsource it to the supplier who makes and fills the pods, which entails an improvement on the green aspect 'energy use' compared to other products in the market. One variety of Piccolo is a sustainable and organically grown coffee (comparable to Mex-Eco), which is greener than the three other varieties. In the case of Piccolo, the general orientation towards green issues in the companies ensured that the product is still greener than many competing products even if green issues, in the perception of the firm, did not receive any attention during the product development process. In the firm, commitment to green issues is at such a high level, that green issues permeate the choices made in the development process, even if no particular effort is made in that area in the specific project.

Like greenness, newness of the innovation is an innovation characteristic that is difficult to assess. In the analysis of newness, the multidimensionality of this elusive construct is acknowledged. Innovation literature acknowledges three dimensions of newness: the degree in which a product entails new technology to the industry, the degree to which a product entails new technology or management practices to the innovating firm, and the degree to which an innovation is new to the customer (Damanpour 1988; Green et al. 1995; Garcia and Calantone 2002). Informants were asked to make assessments of newness of the product on these three dimensions. In the analysis, newness to the customer is conceptualized as the degree to which a product has an effect on established consumption patterns (Robertson 1971; Gatignon and Robertson 1991). In this conceptualization, an innovation is highly new or 'discontinuous' if it creates new consumption patterns. In the case of Topcoat, for instance, the product completely changed the way in which car repair shops operate, in terms of work flow, equipment, product handling, sprayer operations, and end user expectations. The results in Table 2.9 show that the three conceptualizations of newness are unrelated, and thus independent dimensions of newness.

For Bennet, one dimension of newness, newness to the firm, is not assessed, because the firm was established especially for the manufacturing and marketing of the product. Although in the case study only the application of Bennet as recycling agent is studied, which was developed later, the product is essentially the same as the original Bennet. Because of highly conflicting views of the informants on this issue, newness to the firm could not be reliably assessed.

Relative advantage is conceptualized as the degree to which an innovation is superior to the product it supersedes or with which it competes. Therefore, relative advantage is assessed in the analysis by comparing the product with existing products, both from the case study firm and from competitors. Theoretically, greenness can be a form of relative advantage, if consumers attach importance to green aspects associated with the product category, and if the innovation outperforms other products on one or more of these aspects (Driessen and Hillebrand 2002). The latter is the case with two products: Bennet and Mex-Eco. In the case of Ecocoat, consumers did not attach importance to the green aspect that was improved. In the case of mayonnaise, relative advantage is related to a green aspect but greenness is not a source of relative advantage *per se*. The fact that free-range egg yolks were used in the mayonnaise, was not communicated by the firm and perceived by consumers as a green aspect, but rather as a signal of product quality. From the results of the case studies, it can be concluded that the relationship between greenness and relative advantage *can* occur, but that it is by no means a fundamental relationship.

Product costs are the costs for researching, developing and manufacturing the innovation. The costs can be fixed, like R&D costs, or variable, like material costs. Informants were asked to compare the product to other innovations in the firm or competing innovations, based on their knowledge on financial costs. In most cases, limitations of the internal accounting systems prevented informants of making an accurate assessment, and they had to resort to an educated guess or qualitative assessment. The analysis shows that the source of high product costs varies: sometimes it is mostly fixed, e.g. enormous R&D investments that need to be recovered (Ecocoat), sometimes the source is mostly variable, e.g. high raw material costs (Mex-Eco). In some cases, there is evidence of greenness leading to higher product costs, most notably in the case of Mex-Eco and Mayonnaise.

The analysis shows the outcomes of the balancing green and non-green issues in the development process, as reported under 'priority of green issues' in Table 2.8. In some cases there was a trade-off between greenness and relative advantage, and/or between greenness and product costs. All green and very green products in the study have high or very high product costs, which suggests that none of the firms succeeded in developing a green product without incurring extra costs. In the case of Topcoat Pro, greenness was improved by using less toxic and more expensive pigments, but was sacrificed by increasing the VOC level to ensure better application properties of the product. In other cases, where green issues were given higher priority, the outcome of the trade-off was in favor of greenness. In the case of Mex-Eco, the firm opted for a highly green product, even though this would lead to very high product costs. Furthermore, there is evidence of highly green products leading to very new products, suggesting that sometimes there is a relationship between greenness and a dimension of newness. This evidence is found in the case of Aquacoat, where developing a green product based on water-borne technology required that the firm first acquire this technology.

2.7 Product Introduction

Next to product innovation characteristics, characteristics of the product introduction presumably play an important role in the success or failure of green products. Product introduction is conceptualized as the whole of marketing activities undertaken when the innovation is first released to the market and continues until the 'growth' phase of the product lifecycle sets in. The period that is analyzed as 'product introduction' differs between cases because of three reasons. First, because products in the case studies were not introduced at the same time, there are vast differences in the time elapsed since the product's release, thus allowing for a longer period to be studied in some cases, and limiting the time frame in others. Second, the product life cycles of the eight products are most likely not of equal shape and length, implying that the 'introduction' period differs between the cases. Third, some cases had several 'waves' in the introduction strategy, where a 'relaunch' or revised introduction strategy was used after the initial introduction strategy had brought limited success. In these cases, the 'introduction' period is taken very broadly. Bennet recycling agent is the most extreme case, which was still in the introduction phase years after initial release.

The introduction of the product innovations in the cases is characterized by introduction strategy and introduction tactics, as identified in Chapter 1. Informants were asked to elaborate on these topics. Analysis of the data shows that the introduction strategy can be adequately described by a typology in two dimensions: targeting and positioning. This scheme corresponds to the dominant paradigm found in most marketing textbooks to describe marketing strategies (e.g., Cravens and Piercy 2003 pp. 197-223). Introduction tactics refer to decisions concerning marketing instruments, such as sales force, pricing, and marketing communication. Results are summarized in Table 2.10.

The data reveal several types of targeting strategies. First, a mass targeting strategy was identified, where the firm employs an unconcentrated approach, marketing the same product in all or almost all market segments. Second, a segmented approach, aimed at one or a few market segments. Third, a niche strategy, in which the marketing strategy focuses on one small subsegment of the market with a set of highly specific needs. Within the latter two, concentrated, strategies, some of the cases used a targeting strategy aiming at a green niche or segment(s). In these cases, informants indicated to believe that a niche or segments exist in which consumers derive value from the greenness of a product. When marketing efforts for the product were concentrated on the green niche or segment(s), this strategy was assessed as a 'green niche' or 'green segments' strategy, respectively. Note that not all cases had the same market scope: the products in the chemical industry were sold internationally, in most of the developed world, whereas the three food products were sold mostly domestically.

In three cases, sequentially different targeting strategies were applied. The most extreme case is Bennet, where the targeting strategy was distinctly different under different management regimes the company had since the invention of Bennet. The in-

Table 2.10: Introduction Characteristics

Case	Introduction Strategy		Introduction Tactics
	Targeting	Positioning	
Topcoat	Mass, global	(first) Functional, longevity and gloss (later) Functional, profitability	Slow, training and demonstration, high pricing
Ecocoat	(first) Segment, 'med segment' (later) Mass, as turned out price was too high	Green, new technology with low toxicity	Slow, high pricing, generate free publicity
Aquacoat	Green niche, green frontrunners	Functional, better functionality than other waterborne products	Slow, high pricing, skimming
Topcoat Pro	Segment, non-green existing customers	Functional, car repair shop profitability	Slow, replace Topcoat with existing customers
Bennet	(first) Mass (then) Green Segments (later) Green Niche	(first) Functional, panacea (later) Green, enables recycling	(not assessed)
Mex-Eco	(first) Segment, existing customers (later) Green niche, local gov't, financials	Green, with certifications EKO and Max Havelaar	Slow, through personal selling and POP promotion
Piccolo	Mass, hotels, cafés and restaurants	Functional, variety in assortment	Slow, through personal selling and POP promotion
Mayonnaise	Segments, high quality	Functional/Green, free-range eggs as quality cue	Rapid, price promotions, outdoor advertising, (later) tv commercial

ventor of the product attempted to market the product to a variety of markets, both as a recycling agent and in other applications, convinced that the product was a panacea for many users in the plastics industry. Later, after the firm changed ownership, a new CEO implemented a more concentrated approach, in which an essentially similar product was sold to a variety of non-green and green, recycling-related, markets. After a conflict between the inventor and the CEO, another new CEO stepped in, implementing an even more concentrated targeting strategy, convinced that the Bennet recycling agent was only interesting for a small group of plastic and rubber recyclers. The firm seems to have been probing different targeting strategies, all with limited success, based on different assumptions about market needs and structure. A similar pattern, where targeting strategies emerge based on faulty probes, are found in Ecocoat and Mex-Eco. Ecocoat was initially targeted at a segment of users that were less professionalized than current customers of the firm, but as the sales force found out that the targeted segment did not value the main product characteristic, reduced toxicity, its sales effort started to include current, professionalized, customers of the firm. Mex-Eco was initially targeted at restaurants, cafés, and hotels that were customers of the non-green high-quality coffee that the firm was marketing, with very little suc-

cess. After a restructuring of the sales organization, a concentrated targeting strategy was applied, targeting a niche of institutional coffee users with a high green and social commitment, like local governments, and companies that had been identified as 'cash-rich socially responsible organizations', mostly in the financial sector.

In positioning, two types of strategies can be discerned in the case studies. The first is a positioning based on functional characteristics or advantages of the innovation, in which green issues play no or a minor role. The second positioning strategy identified in the cases is a positioning on green aspects, such as low toxicity (Ecocoat), recycling enabling properties (Bennet), or organically and sustainably grown (Mex-Eco). As with targeting, firms were also probing for the right positioning in some cases. With Topcoat, the company soon discovered that the functional attributes that were being communicated initially were of low importance to customers compared to other functional characteristics of the product. In the case of Bennet, initial positioning matched the original mass targeting strategy, positioning the product as a panacea for blending or alloying plastics. With Piccolo, one informant indicated that the firm was still 'searching for the right sales strategy'. Such probing behavior of firms could be due to a low level of market orientation, as shown by the results in Table 2.7, or more specifically with green products, lack of information on green customer segments/niches.

All but one of the cases adopted either a functional or a green positioning. Only Mayonnaise had a mixed positioning. The fact that the product was made of free-range eggs was the only attribute being highlighted in marketing communication. At the introduction of the product, the firm launched a large outdoor advertising campaign under the heading 'Free-Range Mayonnaise', and later a television commercial emphasizing free-range eggs as raw material. No specific green claim was made however, as for improving animal well-being for instance. A marketing informant explained that research had shown that customers perceived the use of free-range eggs as a 'quality signal', that the mayonnaise was made of the best ingredients. The positioning is therefore assessed as mixed functional and green, with the functional positioning dominant.

Many certifications exist for communicating green aspects of products, such as the Dutch environmental label. These certifications can assist in achieving a green positioning (OECD 1991; Ackerstein and Lemon 1999). Only two cases used such green certifications. Mex-Eco had two certification labels: Max Havelaar for sustainable production, and EKO-label for organically grown coffee. Mayonnaise featured a government-sponsored certification that the product is produced with free-range eggs.

Introduction tactics are characterized by the use of marketing instruments, such as sales force, pricing and marketing communication instruments. Two different patterns emerge from the data. The first is an introduction with limited use of marketing instruments, relying on a slow diffusion of the innovation in the targeted market. The second tactical introduction pattern relies heavily on the use of several marketing instruments, which was only found by Mayonnaise. The launch of the product was supported by relatively large budgets for advertising and price promotions. The 'slow' pattern of introduction, on the other hand, was observed in the car refinish industry

and the two Peeze products. The explanation offered by the informants why a certain introduction tactics was adopted pointed mainly to general characteristics of the market or the firm. If anything, tactics seem to depend on targeting and/or positioning strategy, but do not show a clear relationship with green product innovation. Introduction tactics in the cases possessed no unique characteristics that could be linked to green product innovation strategies, compared to non-green product innovation strategies. Introduction tactics for Bennet could not be reliably assessed, but no evidence was found of heavy use of any marketing instrument.

2.8 Innovation performance

Innovation performance is conceptualized as possessing three dimensions, following the preliminary research framework in Chapter 1: financial performance, customer performance, and technological performance. Financial performance is operationalized as the profitability of the innovation compared to industry norms. Customer performance is conceptualized as the sales or market share relative to competitors. Technological performance refers to the degree in which a product established a technological 'platform' from which other innovation can be developed. However, the data also suggest innovation outcomes that can be seen as other dimensions of performance not linked to one of the three *a priori* identified dimensions. Results on innovation performance of the cases are reported in Table 2.11.

A potential problem in assessing innovation performance is the time frame that is applied. If innovation performance is assessed too early after launch, the product can still be in a nascent state and innovation performance might be underestimated. Therefore, informants were encouraged to judge the innovation over as long a time frame as possible. This corresponds with the natural inclination of most informants.

Table 2.11 shows that cases cover the entire continuum on the financial performance dimension: from 'very low' to 'very high'. Please recall that cases are selected partly on a *a priori* judgment of success or failure, which explains for the distribution. Two cases warrant special attention. Bennet's financial performance is low, for a particular reason. The product, in its application as recycling agent, was sold for a long time at a minimal margin to recyclers, whereas virtually the same product was sold at higher margin for other applications. Mex-Eco also has low financial performance, because the product has not moved beyond the break-even point. This was, however, in correspondence with the firm's objectives. The product was introduced from a strong commitment to green issues, not to fulfill high profitability objectives. Informants indicated, however, that the product was much less profitable than other products in the market, and was therefore assessed as having 'low' financial performance.

Customer performance shows a strong correlation with financial performance. The most notable exception is Mayonnaise, with moderate financial performance linked to a high customer performance. The innovation did strengthen the market position of the product, but it also harmed the product's profitability because the product costs were higher for the innovation than for the previous version of the product. Topcoat

Table 2.11: Innovation Performance

Case	Financial Performance	Customer Performance	Technological Performance	Other
Topcoat	Very high, due to high markup pricing	Very high, became market leader	Very high, created platform for whole product generation	Gained the firm reputation of technology leader
Ecocoat	Low, due to small sales volumes	Low, product discontinued because of bad sales	Very high, patents were basis for other products	None
Aquacoat	Low, high gross margin is not nearly enough to recover fixed costs	Very low, only a few customers	Very high, 'technology of the future'	Reputation effect: customers like to see it in the assortment
Topcoat Pro	Moderate, satisfactory profitability	Moderate, market success differs over countries	Low, was spin-off from other product	Low expected long term performance
Bennet	Low, was sold with minimal margin to recyclers	Low, small volumes	High, has many different applications	Awareness, through showcase project
Mex-Eco	Low, zero margin	Moderate, relatively high market share growth	Moderate, some spin-off to other products	Reputation Organizational identification Cross-selling
Piccolo	Very low, due to very disappointing sales	Very low, very disappointing sales	(not assessed)	Organizational identification
Mayonnaise	Moderate, less than average	High, market share growth	(not assessed)	None

Pro shows considerable differences in customer performance over different countries. Informants explained that this was caused by expected or announced regulation in some countries. In markets awaiting VOC regulation, it was clear that the product would not comply to regulation within foreseeable time. Aquacoat shows the opposite effect: whereas it was not very successful in financial or customer terms at the time of data collection, it was expected to be the 'technology of the future' (and eventually became very successful in regulated markets). Piccolo shows considerable variety over the four different varieties: the Mexican – and greener – variety outsold other varieties two-to-one.

Technological performance is difficult to assess reliably for the three food products. The only reliable information on technological performance for the food products was obtained in the case of Mex-Eco where the used technology, the integral chain management approach, appeared useful for other innovations as well. For the other cases, informants found it difficult to provide reliable information, but enough data were gathered to make an assessment with a satisfactory level of reliability. The findings

suggest that technological performance is quite independent from financial and customer performance, because high technological is shown to coincide with both high and low levels of the two other innovation performance measures.

The last column of Table 2.11 lists additional assessments of innovation outcomes, other than financial, customer, or technological performance, for which indications emerged from the data. In the case of Topcoat Pro informants predicted that performance beyond the time of data collection would be low, because markets were moving away from single-stage topcoats and some markets were moving towards VOC regulation that would render the product non-compliant. For six other cases, outcomes other than financial, customer, and technological performance are identified. The data suggest that they are all somewhat related to reputation. For the breakthrough innovation Topcoat, the product gained the firm the reputation of technology leader. That same reputation was under pressure before the introduction of Aquacoat, because customers expected the firm to be a leader in waterborne technology. Bennet as recycling agent gained large awareness in the plastics industry by cooperating in a showcase project, in which inhabitants of a city were asked to hand in old plastic garden furniture, to be recycled to stadium seats in a local soccer dome stadium. "Everybody in the industry knows Bennet", because of the publicity surrounding the project, according to one informant. Mex-Eco had reputation offsets, both in the market as in the organization. Being the first-to-market with a double-certified coffee, the firm gained a reputation of being a socially responsible corporation. Also, Mex-Eco clearly contributed to organizational identification within the firm, which can be seen as a form of internal reputation. A similar organizational identification can be observed with Piccolo, where one informant explained that the major reason that the product had not been withdrawn was that, in spite of very disappointing sales, 'everybody just loves the product' and thought it fit very well with the firm to have a product like Piccolo.

2.9 Results of the Cross-Construct Analysis

The goal of the last step in analysis is twofold: to better conceptualize constructs and to identify patterns that suggest relationships between constructs. Results of the theory-building cases are reported in a condensed format in Table 2.12. The table presents variables partly re-grouped in constructs, as well as the most salient and discriminating findings about each construct. The findings in the table give only a 'birds-eye' view of the results, because inevitably in this stage of analysis, some of the unique features of the cases are lost in the higher level of abstraction.

Identified Constructs

The constructs identified to be relevant for GPI strategy are different from the preliminary research framework. The initial construct 'green orientation' was shown to consist of three distinct and independent constructs (see Table 2.8): green company policy, green information collection and use in the project, and priority of green issues in the project. This conceptualization has a number of consequences for further analyses. First, green company policy is added as an antecedent to green product innovation strategy. Second, green information collection and use in the project is added as an antecedent, in which the role of the quality of information is also ac-

knowledged. Third, a category of constructs is added: development process characteristics. The development process characteristics include the priority that was given to green issues in the product development project, and the coordination between business functions during the product development project. Furthermore, the results about introduction characteristics showed that the role of green issues in targeting and positioning adequately describe the introduction of GPIs. The results in Table 2.8 also reflect the finding that innovation performance can include organizational identification and reputation effects.

The results show that greenness and priority of green issues are not the same. The priority that was given to green issues during the development process is not perfectly associated with product greenness. Bennet is the deviant case in this respect, because it was originally not developed for green applications, but is green nevertheless. This case shows that it is possible to develop a green product without devoting specific effort to green issues during the development process, i.e. by serendipity. This finding suggests that a better understanding is gained by studying the priority that is attached to green issues during the development process as a construct that is conceptually different from product greenness.

Identified Patterns

From the cross-construct analysis it is possible to identify patterns of association that suggest relationships between constructs. The results show an associative pattern between market environment, greenness, and targeting strategy. If a green product was developed, then a green niche targeting strategy is used, under the condition that a green niche was present or emerging. In the case of Ecocoat, a green product was developed, but with green demand absent, a mass targeting strategy was adopted, with little success. Piccolo is a special case. Although the product was moderately green, and a green niche was present, the product is not targeted to a green niche. It is striking that the most green variety of Piccolo, the Mexican organically grown coffee, was by far the most successful variety in terms of customer performance. The variety was particularly successful with a niche of customers who were selling 'regular' non-green coffee in their establishments and wanted to add a green coffee to their assortment. This implies that green niche targeting could have been applied for Piccolo, if only for the Mexican variety.

A noteworthy pattern of product characteristics, targeting and positioning is observed for Aquacoat. Although Aquacoat is a green product and targeted at a green niche, it is *not* positioned as a green product. The product's positioning was described by an informant as: "if you want to use waterborne car refinish, you'd better use our product because that will least hurt your profitability." The positioning is such, that within the green niche, it has the best functional characteristics. Market environment could explain this strategy: several competitors had moved into the small niche of waterborne car refinishes and rather than joining a rat race of who has the greenest product in the niche, the firm opted to emphasize other product characteristics.

Table 2.12: Summary Results of the Theory-Building Cases

Case [a]	Market Environment	Antecedents		
		Green Company Policy	**Market Orientation**	**Green Information Collection and Use in Project**
Mex-Eco (1)	Declining, unregulated market, emerging green niche (food)	High green commitment	Low customer Low competitor	Information not collected
Ecocoat (2)	Stable unregulated market, no green demand (chemicals)	Moderate green commitment	Low customer Low competitor	Low quality information about regulators
Aquacoat (3)	Stable market, regulation expected, emerging green niche (chemicals)	Moderate green commitment	Moderate customer High competitor	Low quality information about competitors
Bennet (4)	Growing, unregulated market, emerging green niche (chemicals)	(not assessed)	Low customer Low competitor	Information not collected
Piccolo (5)	Declining, unregulated market, green niche (food)	High green commitment	Low customer Low competitor	Information not collected
Mayonnaise (6)	Stable, unregulated market, green demand in related market (food)	Moderate green commitment	High customer High competitor	High quality information about consumers
Topcoat Pro (7)	Stable market, regulation expected, emerging green niche (chemicals)	Moderate green commitment	Moderate customer Moderate competitor	Information not used
Topcoat (8)	Growing unregulated market, no green demand (chemicals)	Moderate green commitment	Low customer Low competitor	(not assessed)

[a] Cases are presented in decreasing order of product greenness. Numbers between parentheses are rank orders.

Table 2.12: Summary Results of the Theory-Building Cases (continued)

Case	Green Product Innovation Strategy			Innovation Performance
	Development Process Characteristics	**Product Characteristics**	**Introduction Strategy**	
(1)[a]	Very high green priority	Very green Moderately new Low relative advantage Very high product cost	Green niche targeting Green positioning	Low financial Moderate customer Moderate tech. Org. identification Green reputation
(2)	High green priority R&D leading	Green Very new, but mod. to customer Low relative advantage High product cost	Mass targeting Green positioning	Low financial Low customer Very high tech.
(3)	High green priority R&D leading	Green New, but not to industry Moderate/low rel. advantage High product cost	Green niche targeting Functional positioning	Low financial Very low customer Very high tech. Innovative reputat.
(4)	Low green priority R&D leading	Green New to industry & customer Moderate/high rel. advantage High product cost	Green niche targeting Green positioning	Low financial Low customer High technological
(5)	Low green priority	Moderately green New, but not to industry Moderate relative advantage High product cost	Mass targeting Functional positioning	Very low financial Very low customer Org. identification
(6)	Low green priority Marketing leading	Non-green Not new Low relative advantage Moderate product cost	Non-green segment targeting Functional/green positioning	Moderate financial High customer
(7)	Low green priority R&D leading	Non-green Not new Moderate relative advantage Moderate/high product cost	Non-green segment targeting Functional positioning	Moderate financial Moderate customer Low technological
(8)	No green priority	Non-green Very new, but new to firm Very high relative advantage High product cost	Mass targeting Functional positioning	Very high financial Very high customer Very high tech. Innovative reputat.

[a] Cases are presented in decreasing order of product greenness. Numbers between parentheses are rank orders.

None of the green or moderately green products have high financial or customer performance. In fact the three non-green products are the most successful, based on financial or customer performance. A possible explanation for this general observation is that none of the market environments displayed a sizeable green demand. Some green products do have a high technological performance, though. Technological performance does not seem to be directly related to greenness however, but displays a strong relationship with newness to the industry instead. This finding makes intuitive sense, because products that are new to the industry can represent a technological breakthrough, that allows other innovations to be developed based on the same technology.

In Table 2.13, the results on market orientation and the collection and use of green information are condensed. Both constructs are interpreted as reflecting the collection and use of information, about the market and about green issues, respectively. This table does not include the findings about the quality of information. Also, the table illustrates the relationship of antecedents with green product innovation strategy.

Table 2.13: Relationships of Antecedents with GPI Strategy

Information Collection and Use		Green Company Policy	
		Moderate Green Commitment	**High Green Commitment**
Market	**Green**		
No	No		Moderate to green products, even when green priority in project is low. (Mex-Eco & Piccolo)
No	Yes	High green priority, Green product (Ecocoat)	
Yes	No	Low green priority, Non-green product (Topcoat Pro)	
Yes	Yes	Low green priority, Non-green product *In food industry* (Mayonnaise) High green priority, Green product *In chemical industry* (Aquacoat)	

The findings show an associative pattern between the three antecedents on the one hand, and development process characteristics and product characteristics on the other hand. Mex-Eco and Piccolo are extreme cases in this respect, because they were developed with very little information about customers, competitors, and green issues. In the development of Mex-Eco, high priority was given to green issues over other aspects, because of the high commitment to green issues within the company. In the same company however, Piccolo was developed with a low priority for green issues during the development process. Strikingly, the high commitment in the company ensures that even for Piccolo the greenness is still moderate. Observations made in one of the other interviews in the theory-building stage, in a firm with high green commitment that had developed a green product without clear information to backup this decision, point to a similar situation. These findings suggest that green company policy has an influence on green product innovation strategy, independent from the

collection and use of information on customers, competitors, and green issues. Green company policy is a construct not directly related to product development that can explain why some companies develop an ambitiously green product, even if they have no information about the market that suggests such a product will be well-received.

Table 2.13 shows that, under moderate commitment, the collection and use of both market and green information can result in green issues receiving high priority in product development and, consequently, green products being developed. In the case that no green information was collected and used, a non-green product was developed. This suggests that the collection and use of market information alone is not sufficient to explain the development of green products, and that the collection and use of green information has an important influence as well.

The situation in which both market and green information is collected and used is particularly interesting. In this situation, two different processes and products are observed: either non-green or green. The explanations by the informants suggest that the market environment can explain this difference. In the food industry, where there was no green demand in the market, except in an adjacent market, collecting and using information led the firm to the conclusion that a green product would not be successful. The firm decided to attach little priority to green issues, developed a non-green product, and used the small green improvement as a quality signal, rather than a green benefit. In the chemical industry however, a niche demanding waterborne technology was emerging. A competitor had moved in with a waterborne product, and regulators were drafting VOC regulation. Collecting and using information in this market environment had a more positive impact on the priority of green issues in the development process. As a consequence, a green product was developed, and marketed to a green niche. This finding suggests a moderating effect of the market environment, in addition to the effects of information collection and use.

Table 2.14 provides a more in-depth view on the determinants of innovation performance of the eight cases. The reported findings in this table are mostly based on the attribution of success or failure by the informants during the interviews, but also on interpretation of the results of preceding analyses in this chapter.

Topcoat is the only case where success or failure can be attributed to a single construct. Informants agreed that the success of Topcoat was caused solely by its revolutionary product characteristics. The other cases show a much more mixed picture, in which several factors determine performance in conjunction. Product characteristics, however, are identified as a determinant of customer and financial performance in every case.

The most successful green product is Mex-Eco. Informants attribute this to the very high level of greenness of the product, “in which everything is right”. This product is well received by a green niche. The other three green products, Ecocoat, Bennet, and Aquacoat, have low or very low financial and customer performance. In all three cases, this is attributed to a failure to collect and use high quality information about

green issues. Also, limited demand for green products in their respective markets seems to account for the low levels of performance.

Above results do not take into account whether a construct has a direct influence on innovation performance, or that the relationship is mediated by another construct. The next chapter adds a more theoretical perspective that allows for a more structured analysis, by combining theoretical findings and the theory-building case study results.

Table 2.14: Relationship of Performance With Other Constructs

Case[a]	Innovation Performance		Explanations for Financial and Customer Performance (with construct category)[b]
	Financial	Customer	
Topcoat	V. high	V. high	(Prod.) Very new product, with very high relative advantage
Mayonnaise	Moderate	High	(Ant.) High market orientation, high quality green info (Prod.) Hardly changed product with moderate product cost (Intro.) Mixed functional/green positioning (Env.) Market somewhat sensitive to green issues
Topcoat Pro	Moderate	Moderate	(Ant.) Moderate market orientation (Prod.) Non-green product with moderate relative advantage (Intro.) Non-green targeting (Env.) Market with only an emerging green niche
Mex-Eco	Low	Moderate	(Prod.) Very green product (Intro.) Green niche targeting with green positioning (Env.) Green emerging niche
Ecocoat	Low	Low	(Ant.) Low market orientation, low quality green information (Prod.) Green product w/ low relative adv., high product cost (Intro.) Mass targeting with green positioning (Env.) Market with no green demand
Bennet	Low	Low	(Ant.) Low market orientation and no green information (Prod.) High product cost (Intro) Initially mass/green segment tgt'ing rather than niche (Env.) Market with only an emerging green niche
Aquacoat	Low	V. low	(Ant.) Low quality green information (Prod.) New-to-consumer product with mod./low relative adv. (Intro.) Green niche targeting (Env.) Market with only emerging green niche
Piccolo	V. low	V. low	(Ant.) Low market orientation (Prod.) (Mod.) new-to-cons. product w/ high product cost (Intro.) Mass targeting

[a] Cases are presented in decreasing order of performance.
[b] Labels between parentheses indicate the construct category: Ant.=Antecedents of GPI Strategy, Prod.=Product Characteristics, Intro.=Introduction Strategy, Env.=Market Environment.

2.10 Discussion

In this section, conclusions regarding theory-building will be drawn from the results. Goal of this section is to elaborate on the findings and to augment the opportunities for further research emanating from the theory-building case studies without unduly repeating the information contained in the previous sections. The discussion is organized in four themes.

The Nature of Green Product Innovation Strategy

The case studies reveal that the extant model found in the product innovation literature can be applied without much difficulty. GPI is not fundamentally different from other product innovation, yet certain features of GPI are identified that are important to understand GPI strategy but easily overlooked by a 'traditional', non-green, product innovation perspective.

An important aspect that is unique to GPI strategy is the balancing of green versus non-green issues. The two control cases, products that were identified by firms as products where green issues did not play a role during development, followed development processes not dissimilar to the other six products. In fact, both control products did possess 'green' aspects to some degree. In the present business landscape, it is difficult to imagine that green aspects do not enter the product innovation strategy of a firm, albeit to a very limited degree. The reverse is also true: the development process of some products that were identified as 'green' products *a priori*, turned out to have sacrificed the main green improvements in favor of other product characteristics, i.e. relative advantage or lower product cost. This suggests that the main focus of a study should not be to develop an entirely new model of product innovation unique to GPIs, but to acknowledge the balancing of green issues and other issues in the development process and its consequences for the product characteristics, introduction strategy, and performance.

One construct that appears to have an impact on how green issues permeate product innovation strategy, is the green company policy. A firm with a high green commitment policy can develop highly green product innovations, which cannot be explained by a 'market orientation – innovation – performance' perspective. The data suggest that, together with a broadened market orientation construct (to be discussed in the next subsection), commitment in green company policy offer a complete set of antecedents to GPI strategy.

Furthermore, the data show that firms can differ dramatically on the priority that is given to green issues in a certain product development project. This implies that balancing of green and other issues can have very different outcomes in the way that trade-offs between product characteristics (greenness vs. relative advantage, greenness vs. product cost) are resolved. A distinction is made between the balancing of green vs. other issues in the process on the one hand, and the outcome of this balancing process, the product characteristics.

Finally, a typology in introduction strategies emerged from the data. The results suggest that central to this typology is whether firms target a green segment or niche, or not. A similar observation can be made for positioning: some firms chose to emphasize the green improvements in their products, where others chose to focus on other aspects.

Broadening the Market Orientation Construct

Green issues enter the GPI strategy in several ways. The importance of green company policy is already identified in this section. The starting point of the theory-building case studies was to study green orientation as a sort of analogy to the market orientation construct. The data, however, provide several observations that give rise to a broadening of the existing market orientation construct:

- Market orientation, operationalized as customer orientation and competitor orientation, is insufficient to explain GPI strategy. Some products are developed because of expected regulation, shareholder influence, or developments in the supply chain for instance. The scope of market orientation needs to include a broad range of developments in the environment of firms to adequately explain GPI strategy.

- Specific 'green' information is collected and used in GPI strategy, which can be linked to various stakeholders of the firm, e.g. customers (Mayonnaise), competitors (Aquacoat), regulators (Ecocoat). Furthermore, the case studies identified several stakeholders other than customers and competitors that have some level of importance in the product innovation strategy. Therefore, a stakeholder approach (Freeman 1984) would appear to be fruitful.

- The data about the collection and use of green information reveal the importance of the quality of information. In a number of cases, firms acted on information that was not reliable. Instead of being able to preempt or even influence developments in green issues, these firms found themselves at a disadvantage. Although not observed very prominently in the data of the case studies, a similar argument can be made about market orientation (Slater and Narver 1998), which suggests that a broadened concept of market orientation should well reflect a 'quality of information' aspect.

These three observations give rise to a construct very similar to the market orientation construct, that incorporates (1) all stakeholders about which information is collected, and (2) the quality of information, being the degree in which it enables a firm to be really forward looking in product innovation strategy. The next chapter offers a theoretical perspective on these findings and proposes a 'stakeholder orientation' concept to this study to reflect the above. This brings up the question of the relevance of a 'technology orientation' construct, which was used in the theory-building cases. 'Technology' is generally not regarded as a stakeholder, because it does not conform to the definition of a stakeholder as a 'group or individual' (Freeman and McVea 2001). This does not appear to be a insurmountable problem, however, because the comprehensive nature of the proposed stakeholder orientation concept implies that

any development in the environment of the firm can be monitored, including technological developments. Technology does not occur in a vacuum: some stakeholder will be involved to transfer at least the seed of the technology into the organization.

The Role of Market Environment

Although the results of the data analysis are not capable of offering conclusive support, the findings indicate a possible moderating role for market environment. In several instances, the market environment can be used to provide a logical explanation of an anomalous pattern. The role that green issues play in the market environment is used to explain the relationship between antecedents and characteristics of GPI strategy (see Table 2.13), and is also used as an explanation for innovation performance (see Table 2.14).

More specifically, two aspects of market environment emerged as potentially important: the existence or emergence of green demand in a market and the existence or emergence of green regulation. The influence of green demand appears to be stronger in the food industry, whereas regulation exerts a stronger influence on the chemical industry. Note that none of the cases studied had stringent regulation in (a substantial part of) their markets at the time of the data collection. Differences would be more clearly observed when markets with stringent green regulation are contrasted with markets without green regulation. New regulation was, however, announced for the car refinishes market, for instance in the Netherlands, during the data collection. Several informants in that industry indicated that they expected the industry to undergo dramatic changes as a consequence of new regulation in many areas of the world. Thus, although the data show some indications of the role of regulation, its impact on GPI strategy would be better observed if at least one case study was taken from a stringently regulated industry.

Other empirical work, has found similar results, in that either the market environment or, broader, the industry environment, has an impact on the role of GPI antecedents. In a descriptive study, reporting on twenty interviews about GPI, Wong et al. (1996, p. 268) state that factors that determine whether new green consumer products are developed and introduced "[…] vary across firms and product sectors". Banerjee et al. (2003) find, in a structural equation modelling study, a strong moderating effect of the role that green issues play in an industry on many relationships in their model of antecedents of corporate environmentalism. Therefore, the role that market environment, or broader, industry environment plays in GPI strategy, will be elaborated upon in the next chapter.

Broadening Innovation Performance

Finally, the findings on innovation performance reveal that (1) firms mention dimensions of innovation performance other than financial, customer, or technological performance as performance objectives and (2) some green products have performance outcomes other than financial, customer, or technological performance. Therefore, the case studies imply that innovation performance may be broadened to include other performance indicators.

The most-mentioned other performance indicator was some form of reputation enhancement, either in the domain of technology leadership or green leadership. Three product innovations were shown to contribute to the reputation of the firm as a whole, or were developed in order to contribute to the reputation of the firm. This finding corresponds with the theoretical work of Menon and Menon (1997), who include corporate reputation, next to business performance, as an outcome of green strategies, as well as the empirical work of Drumwright (1996), who found that 'external image' is an outcome of advertising campaigns with a social dimension.

Chapter 3: Theoretical Model

This chapter represents the second part of the theory-building stage. In Chapter 2, results of the theory-building case studies are reported. Parallel to the data collection and analysis of the theory-building case studies, results of the case studies were compared with findings from the literature. In this iterative process, a theoretical model was developed that acknowledges the outcomes of the theory-building case studies (Eisenhardt 1989).

3.1 Introduction

The theory-building case studies revealed that green product innovation is not fundamentally different from conventional product innovation, but that there are certain elements that present differences and are easily overlooked by applying the conventional paradigm. "The biggest challenge for academics and practitioners, however, is the effective 'integration' of these two paradigms." (Pujari et al. 2004, p. 389). In Chapter 2, four themes were identified that need to be acknowledged in theory-building: (1) the nature of GPI strategy (including the role of green company policy, balancing of green and non-green issues, priority of green issues, and the role of green issues in introduction strategy), (2) broadening of the market orientation, (3) the role of market environment, and (4) broadening innovation performance.

The present chapter proposes a theoretical framework of antecedents and consequences of including green issues in product innovation strategy that acknowledges these themes. The structure is as follows. First, resource dependence theory provides an organizing framework how issues of interest to both market and non-market stakeholders are integrated in strategic decisions. Four challenges are identified. Second, literature will be reviewed on each of these four challenges in GPI strategy. This will identify how green issues are integrated in product innovation strategy. Third, literature about the effect of integrating green issues in product innovation strategy on value generation are reviewed. This yields insight into the consequences of incorporating green issues into product innovation strategy for product characteristics, introduction strategy, and economic performance. Fourth, a conceptual model based on the extant product innovation management literature is developed. In this stage, sets of antecedents, GPI strategy components, and consequences are conceptualized. Fifth and finally, specific and testable propositions about relationships between the constructs are forwarded.

3.2 Market and Non-market Stakeholders in Product Innovation Strategy

The role of non-market stakeholders has received little attention in product innovation research. The extant research on product innovation addresses the topic of how information from the external environment is integrated in product innovation strategy by studying the impact of customer and competitor orientation on product innovation (e.g. Gatignon and Xuereb 1997; Han et al. 1998; Lukas and Ferrell 2000; Langerak et al. 2004), the R&D-marketing interface (e.g. Gupta et al. 1986; Pinto and Pinto 1990; Griffin and Hauser 1996; Leenders and Wierenga 2002) and the role of cus-

tomers in product innovation (e.g. Von Hippel 1978; Griffin and Hauser 1993). Customers and competitors are the two stakeholders of the firm that are most recognized when studying how external information is integrated in product innovation strategy. This is not surprising because customers and competitors are two essential components of any free market in which a firm sells its products, and it stands to reason that information about these two components is crucial for product innovation. Market stakeholders are stakeholders that take part directly in the exchange processes on the product market in which the firm sells its products. A stakeholder is defined as "any group or individual who is affected by or can affect the achievement of an organization's objectives" (Freeman 1984). This definition implies that the firm's stakeholders are not restricted to its product markets. Research in product innovation has much less, however, studied how to deal with complex environments involving multiple stakeholder groups, including both market stakeholders and non-market stakeholders, such as regulators and special interest groups (SIGs). Resource-dependence theory provides some insights in how firms give meaning to complex environments, such as environments in which both market and non-market stakeholders play important roles.

Challenges in Dealing With Complex Environments

Dealing with complex environments entails *environmental enactment* (Weick 1969), the process of giving meaning to the environment. Pfeffer and Salancik (1987) point to four types of challenges in environmental enactment, that provide a theoretical underpinning to some of the results of the theory-building cases: scope, scrutiny, commitment, and balancing (the four labels are not by Pfeffer and Salancik, but are used here for clarity of presentation).

1. *Scope: acknowledging all important stakeholders.* By misreading the interdependence of the organization with stakeholder groups, organizations can fail to attribute importance to stakeholders with possibly detrimental results (Pfeffer and Salancik 1987). By limiting its efforts on market stakeholders, academic research on product innovation does not yield insight in how firms are coping with this challenge.

2. *Scrutiny: ensuring that stakeholders are not misread.* Even if all important stakeholders are recognized, essential information about these stakeholders may be not collected, filtered out, or altered, leaving an organization unprepared to face possible threats to survival (Pfeffer and Salancik 1987). Scrutinizing environmental information should allow the firm to be pro-active rather than reactive in product innovation (Urban and Hauser 1993). If research does not address the scrutiny that firms apply in collecting and interpreting information for product innovation, it may lead to an incomplete understanding of how market orientation impacts product innovation (Slater and Narver 1998).

3. *Commitment: overcoming inertia.* Firms may identify important stakeholders and read their interests correctly, and yet fail to adapt to their environments because they are committed to their past (Pfeffer and Salancik 1987). A lack of commitment to make the necessary changes in response to environmental information is

potentially harmful to the firm. Organizational inertia is an important reason why information about the environment is not used in product development (Adams et al. 1998).

4. *Balancing: conflicting interests of stakeholders.* Satisfying one stakeholder group might run contrary to the interests of another group (Pfeffer and Salancik 1987). Mechanisms for balancing interests in product innovation, especially when many stakeholders are involved, could include cross-functional coordination or priority setting. The latter two are typically not investigated as balancing mechanisms, however.

In studying how firms deal with complex environments, each of these four challenges, and how firms try to overcome them, needs to be addressed.

Relevance for GPIs

GPIs offer an interesting arena for research into the integration of market and non-market stakeholders in product innovation strategy because all four challenges in environmental enactment present themselves simultaneously. The issue of *scope* is particularly salient because GPIs involve a complex and diverse set of important stakeholders, as witnessed by the results of the theory-building case studies. Regulatory stakeholders, for instance, have an interest in containing the environmental effects of products (e.g. the EPA's *Energy Star* program). A more elaborate set of important stakeholders increases the likelihood of conflicting interests between stakeholders, thus increasing the need for *balancing* of interests.

The definition of GPIs in Chapter 1 allows products to differ in 'greenness'; a green product is a relative rather than an absolute notion. If the level of greenness is allowed to vary, this implies that it can be traded off against other product characteristics. Moreover, many authors have observed an inherent conflict between economic interests (e.g. of shareholders, an important stakeholder group) and green issues (e.g. of SIGs) (e.g., Walley and Whitehead 1994; Chen 2001). Such trade-offs were also found in the theory-building case studies, e.g. in greenness versus product costs. Firms engaging in GPIs are balancing green versus non-green issues in their development process, product characteristics and introduction strategies. In addition to scope and balancing being particularly salient in GPI innovation strategy, *scrutiny* is proven to be relevant in the theory-building case studies as well as the literature. Over the last decades, firms have frequently misread stakeholders' interests when introducing GPIs, causing a subsequent backfire (Ottman 1998), as witnessed by the Hefty Degradable trash bags example in Chapter 1. Firms have also been shown to have varying levels of *commitment* to integrate green issues in their strategies (Banerjee et al. 2003). Therefore, results from research in GPIs can be a fruitful source for understanding how firms are integrating market and non-market stakeholders in their product innovation strategies. The next section will review research relating to each of the four challenges in environmental enactment in the domain of product innovation strategy, thereby integrating results of 'conventional' product innovation research and research specifically directed to GPIs.

3.3 Challenges to Environmental Enactment in Product Innovation Research

'Conventional' product innovation research has addressed issues relating to each of these four challenges separately, but has yet to provide an integrated perspective on environmental enactment in product innovation strategy in complex environments of market and non-market stakeholders. GPI research on the other hand, while being relatively isolated from other product innovation research, provides some insight. Research on GPI has seriously taken off since the early 1990s and produced a sizeable output. In an attempt to 'map the field' Baumann et al. (2002) report to have identified approximately 325 articles on green product development in management alone, alongside an even far greater number of publications in engineering and policy research. In addition, a journal entirely dedicated to GPI, mostly from an environmental engineering perspective, the *Journal of Sustainable Product Design*, was established. In green product development research however, existing theory on product innovation is hardly used. "Green product development is often treated in the literature as a new subject." (Baumann et al. 2002). Pujari et al. (2003) suggest however that "contrary to the popular perception, […] there is more synergy than conflict between the conventional and environmental product development paradigms". One of the rewards of combining research on GPIs with 'conventional' product innovation research is more insight into the integration of market and nonmarket stakeholders in product innovation strategy. Each of the four challenges to environmental enactment in GPI strategy will be reviewed next.

Scope: Acknowledging Stakeholders

The degree to which stakeholders are acknowledged as being important for the success or failure of the firm differs between firms. Weick (1969, p. 28) notes that "[…] the environment is a phenomenon tied to processes of attention, and that unless something is attended to it doesn't exist". Market stakeholders traditionally receive attention from firms, but as the call for corporate social responsibility grows, nonmarket stakeholders are likely to have a higher impact on the success or failure of a firm (Maignan and Ferrell 2004). Research into market orientation has shown that acknowledging the market stakeholders consumers and competitors influences product innovation strategy (e.g., Gatignon and Xuereb 1997; Han et al. 1998; Lukas and Ferrell 2000; Hult et al. 2004). The impact of acknowledging other stakeholders however, being market stakeholders such as suppliers and distributors, or non-market stakeholders, being regulators, special interest groups and employees has received much less attention (Frishammar and Hörte 2005). Greenley and Foxall (1998) have shown, however, that competitor, consumer, employee, and shareholder orientations are associated with firm performance measures.

On the other hand, the literature on environmental management in general, and GPIs in particular, has devoted considerable effort to studying which stakeholders were considered important by firms when engaging in 'greening' efforts. The main goal of this literature is to uncover antecedents of corporate environmentalism. Using a political economy framework, Menon and Menon (1997) have proposed that environmental marketing strategy has external political, external economic, internal political, and internal economic driving forces. In doing so, they acknowledge that driving

forces of environmental marketing strategy include economic as well as non-economic factors. In a similar vein, public concern, regulatory forces, top management commitment, and competitive advantage have been empirically shown to be antecedents of corporate environmentalism (Banerjee et al. 2003). The relationship between driving forces and performance outcomes, however, has remained unexplored.

When looking at GPI research, the reasons for incorporating environmental considerations in new product development show a potluck of driving forces. These driving (and sometimes inhibiting) forces are often linked to stakeholders. The stakeholder perspective is an important framework for identifying the drivers of GPI (Hart 1995; Polonsky and Ottman 1998; Pujari and Wright 1999; De Bakker et al. 2002). Key stakeholders that stimulate the inclusion of environmental considerations in new product development are regulators, customers, and competitors (Green et al. 1994; Dermody and Hanmer-Lloyd 1995; Wong et al. 1996; Langerak et al. 1998; Polonsky and Ottman 1998; Van Hemel and Cramer 2002). In addition, important stakeholders for GPIs can also be identified in the very end of the supply chain in the form of recycling and disposal organizations (Noci and Verganti 1999). Other stakeholders that were identified as having a significant influence on GPI include suppliers, employees, owners/shareholders, special interest groups, and top management (Polonsky and Ottman 1998; Pujari and Wright 1999). Most of the GPI-specific research, however, is exploratory, in that the driving forces are documented but the relationships between antecedents and performance outcomes of GPI are left unspecified.

Furthermore, results are often contradictory and, as a whole, shed little light on the relative importance of each driving force. Consider for instance two surveys conducted in or around 1997 in The Netherlands (Langerak et al. 1998; Van Hemel and Cramer 2002). Van Hemel and Cramer (2002) report that ‘customer demands’ is the strongest external stimulus for GPI, followed by ‘government regulation’, whereas ‘competitors’ is only mentioned four times by respondents. Langerak et al. (1998), on the other hand, conclude from a different survey that environmental regulation and competitors are the most important reasons for GPI and, surprisingly, find a *negative* relation between environmental sensitivity of customers in a market and GPI. As another example, Polonsky and Ottman (1998) find contradictory results for Australia and the United States when studying stakeholders’ influence on GPI.

Some results of the exploratory studies mentioned above suggest that the nature of the driving force affects performance: some driving forces, or combinations thereof, are more likely to lead to success than others (Van Hemel and Cramer 2002). Case study research on green process and product innovation reveals that each driving force leads to a different pattern of environmental innovation in the supply chain (Azzone et al. 1998). It seems more fruitful to identify patterns that reveal the influence of driving forces on innovation development and introduction, and ultimately, performance, than to explore the relative importance of each driving force.

Scrutiny: Reading Stakeholders’ Interests

The issue of scrutiny in environmental enactment refers to the quality of the gathering, analyzing, and using of information about stakeholders. Similarly, market orien-

tation does not only involve *about what* the information is collected, disseminated, and used but also *how* the information is collected, because they both determine the quality of decision making (Jaworski and Kohli 1993; Jaworski and Kohli 1996). Quality in this regard is a somewhat fiddly subject, however, because the true quality of information gathering, analysis, and use can ultimately only be assessed by the results of the decision making process. One approach is to study the perceived utility of information (Moenaert and Souder 1996).

In another approach, quality is viewed as having an eye for future developments instead of presently observable developments. A truly market oriented firm has distinctive market sensing capabilities even when it finds itself in a seemingly static environment (Day 1994; Slater and Narver 1998). Narver et al. distinguish a reactive and proactive market orientation, in which the latter is defined as consisting of "norms for behavior that guide the business to learn from current and *potential* customers about their *latent* needs, and to act in an entrepreneurial manner to create superior customer value" (Narver et al. 2000 p. 10 [emphasis added]). Together with reactive market orientation, proactive market orientation offers a better explanation for firm innovativeness and performance than reactive market orientation alone (Narver et al. 2004; Atuahene-Gima et al. 2005). Similarly, Chandy and Tellis (1998) find that future market focus, the degree to which a firm emphasizes future customers and competitors, has a strong influence on radical product innovation, through willingness to cannibalize. Understanding latent needs and future market structures is especially important for being able to 'drive markets', as opposed to being market-driven. Driving markets implies that a company is proactive, in that it is able to shape future market structures and/or future market behaviors, and is facilitated if a firm has a "deep understanding of the customer environment" (Jaworski et al. 2000, pp. 51-52).

Through the recent research described above, the importance of generating information with high scrutiny for product innovation has been established in the conventional product innovation literature. The GPI and environmental management literature offers a somewhat different perspective. The concept of proactive management is well-established (e.g., Hunt and Auster 1990). Proactive management is viewed mainly from an action-based perspective, rather than an information generating perspective. Environmental issues have become more important to firms and some firms have responded to this development by not merely a problem-solving attitude, but by taking a pro-active stance by taking actions that go beyond compliance to green regulations. In pro-active environmental management, technological innovations play a crucial role by which firms can achieve competitive advantage (Shrivastava 1995b). In such cases, firms concentrate on technological solutions rather than compliance to regulations (Menon and Menon 1997). Technological solutions allow firms to gain expertise, which improves their chances of fulfilling advisory roles in policy development and ameliorate their negotiating position with regulators (Hoffman 2004). Proactive management requires information that allows for changing the rules of the game, whereas reactive management requires only information that allows for damage control. One of the ways to obtain such information is to engage in dialogues with stakeholder groups. Firms that establish dialogues with stakeholders have more pro-active green management (Klassen and Whybark 1999). The underlying reason

can be that firms who establish dialogues with stakeholders have more opportunity to collect high quality information.

Establishing dialogues with stakeholders is just one way to achieve scrutiny. Scrutiny implies gathering, analyzing, and using of information that emphasizes the future rather than the present. Several methods for developing such foresight have been identified in the product innovation literature, such as developing relationships with academic researchers, vision-building meetings, strategic alliances, and the use of 'futurists' (Brown and Eisenhardt 1997; O'Connor and Veryzer 2001). Most of these methods relate to stakeholders that possess information about future technology. Information about the future can be related to other stakeholder groups as well. Scope and scrutiny are proposed as related but distinct elements of information generation about stakeholders. Table 3.1 illustrates this and lists examples of the types of information that a firm can gather, analyze, and use about various stakeholders with low and high scrutiny. Thus, generating information about stakeholders has two dimensions: width (i.e., scope) and depth (i.e., scrutiny).

Table 3.1: Examples of Information Generation about Stakeholders

	Scrutiny	
Scope (including…)	**Low (limited to…)**	**High (also including…)**
Customers	Expressed wants	Latent needs
Competitors	Current offerings	Future strategies
Regulators	Compliance criteria	Future market rules
Supply Chain Members	Current offerings	Future value generation
Special Interest Groups	Current grievances	Partnering opportunities
Employees	Employee satisfaction	Employee well-being
Shareholders	Earnings expectations	Governance expectations

Commitment to Change

Commitment to the past prevents both senior and lower management to take actions when stakeholders call for a new technology trajectory. Conversely, commitment to change stimulates managers to use information that otherwise would be easily ignored or interpreted differently. Support from senior management is a form of commitment to change that has been studied in previous product innovation research and has been shown to correlate positively with new product performance (Maidique and Zirger 1984; Henard and Szymanski 2001). Commitment to change is also expressed by a willingness to cannibalize, when developing radical product innovations. Willingness to cannibalize implies that a firm encourages employees to work on new technologies and offers a good explanation for the incidence of radical product innovations (Chandy and Tellis 1998).

Commitment to the past is observed in firms displaying inertia, which impedes the use of market information in new product development. Inertia can be overcome by creating an environment that promotes change (Adams et al. 1998; Chandy and Tellis 1998). Schmidt and Calantone (2002) studied the role of growing commitment to the

past in NPD projects, and showed how factors other than information relating to a project's expected performance play a role in managers' decisions to continue a project. Giving managers more credible information did not have an impact on perceived likelihood of success of the project or continuation decisions. Managers were shown to interpret information differently, dependent on the level of commitment they had to the NPD project. This suggests that commitment has a distinct role in influencing product innovation strategies, separate from the information about market and non-market stakeholders.

Research in GPI and environmental management has emphasized commitment to change, in the shape of green commitment. In fact, devising typologies based on green commitment has been one of the major research issues in the start of the field of environmental management. This stream is rooted in corporate social responsibility research, classifying firms from 'reactive', 'defensive', 'accommodative', and 'proactive' (Carroll 1979). Early use a mixture of both commitment related criterions and actual behavior to classify organizations (see Hass 1996; Kolk and Mauser 2002; Buysse and Verbeke 2003). Hunt and Auster (1990) devised one of these early typologies, which has been extensively used in the environmental management literature, in which firms are classified as 'beginners', 'fire-fighters', 'concerned citizens', 'pragmatists', or 'proactivists'. Their typology is also a stage model, suggesting that 'beginners' are least committed and 'proactivists' is the final stage in which environmental management is a priority item for corporate management. Similar typologies have been proposed for green marketing, based on the comprehensiveness in which green issues are addressed in marketing activities (Menon and Menon 1997). Environmental commitment is associated with the perceived importance of stakeholders: proactive firms perceive regulatory, community, and organizational stakeholders to be more important (Henriques and Sadorsky 1999). Also, environmental commitment of top management has been shown to be an important mediator between the perceived importance of regulatory stakeholders and the degree to which environmental issues are integrated in strategies of the firm, including GPI strategy (Banerjee et al. 2003). Furthermore, research in GPI strategy shows that top management commitment is essential for successful GPI projects (Pujari and Wright 1999; Pujari et al. 2003).

Concluding, product innovation and marketing research has shown the importance of both commitment to change and the lack thereof, commitment to the past, in decision making in product innovation strategies. GPI and environmental management research has shown that environmental commitment is associated with stakeholder perceptions and changes the way a firm balances green and non-green issues in product innovation strategies.

Balancing Stakeholders' Interests

Demands of stakeholder groups can be in conflict with each other, such as shareholder's interests for high profits versus strict environmental standards proposed by regulators. Even within a stakeholder group, demands can be conflicting, for instance when environmental SIGs advocate strict environmental standards for pesticides, whereas other SIGs view this as a way to exclude poor countries from the

West's agricultural markets (Maignan and Ferrell 2004). In some cases, these conflicts are easily resolved, such as the interests of the stakeholder group 'competitors', which do not require balancing against other interests in order to enhance performance of the firm. In most cases however, some balancing is involved to resolve dilemmas between conflicting stakeholder issues, like 'controlling pesticides' versus 'economic development in poor countries'.

The product innovation and marketing literature has not dealt extensively with the issue of balancing conflicting interests in product innovation strategy, except where it concerns the interests of different functional units within the firm. It is likely that the marketing function is more perceptive to stakeholders such as customers and competitors, whereas the R&D function is more perceptive to environmental standards imposed by regulatory stakeholders. Several mechanisms of creating cross-functional integration have been suggested to overcome the barriers between R&D and marketing, such as organizational structures, formal management processes, or informal social systems (Griffin and Hauser 1996). Presuming that different functional units have diverging perspectives on stakeholders, cross-functional integration can also serve as a mechanism for balancing stakeholders' interests. The degree of cross-functional integration in new product development has a positive impact on performance (Pinto and Pinto 1990; Kahn 1996; Henard and Szymanski 2001).

Literature on GPI and environmental management is replete with studies that relate to the issue of balancing stakeholders' interests. This is hardly surprising, because GPI involves balancing a set of divergent stakeholder interests *par excellence*. Part of this literature is normative-ethical, advocating a larger role for green issues that arise from various stakeholders (e.g., Shrivastava 1995a). Product innovation strategy needs to address environmental opportunities and integrate green issues into development activities (Roome 1994). Product differentiation based on increased environmental benefits compared to similar products is advocated, and predicted to contribute to firm profitability because of price premiums or market share growth (Reinhardt 1998).

A review of the non-normative-ethical GPI literature shows that balancing can be described by two characteristics of the GPI development process: the coordination of green issues between those involved in the development process, and the priority that is attached to green issues during the development process. Each characteristics has been addressed in a stream of the GPI literature.

The first stream of literature that addresses balancing in the GPI development process deals with how to organize and implement the development of green products. Including green issues in the development process adds complexity to an already complex process. Green issues in product development often transcend the borders of the firm because many environmental effects of products appear elsewhere in the supply chain, e.g., in raw material extraction (Boons 2002). Because of the complex nature of GPI development processes, additional communication and cooperation between different business functions is required (King 1995; Lenox et al. 2000; Handfield et al. 2001). GPI involves a business function that has been typically overlooked in

cross-functional research: environmental management. The role of environmental management departments is essentially one of boundary spanning and to act as conduits of information (King 1995). The environmental management function in a firm typically takes the shape of 'safety, health, and environment' coordinator or department. The primary role of the environmental management function in GPI is to support the development effort with tools such as DfE methodologies, specific knowledge, environmental cost tracking systems and environmental impact assessment, for instance with a life-cycle-analysis (Handfield et al. 2001). Pujari et al. (2003) found that firms in which an environmental manager was an important participant of the project team enjoyed higher performance for their GPIs. Other functional areas that play a role in GPI are manufacturing, purchasing, or sales. In addition to extra business functions becoming involved, environmental experts or 'champions' can exert influence on the process (Andersson and Batemann 2000; Handfield et al. 2001). Organizations engaged in GPI need to develop capabilities for dealing with complex information networks that combine various knowledge resources through communication linkages, and sharing of a common interpretive structure for information (Lenox and Ehrenfeld 1997). In a nutshell, generating information about green issues is not enough: some form of within-firm coordination has to be established to incorporate green issues in the practices of the development process (Pujari and Wright 1996).

The second stream of literature that addresses balancing in the GPI development process is related to the priority of green issues. The theory-building case studies have already shown that balancing in GPI takes place in the development process by determining the priority that green issues receive. The GPI literature suggests several product development strategies for GPIs, which define the priority of green issues. The terminology for the strategies varies across time and geographical regions, and includes labels such as green design, DfE (design for environment), ecological design, environmentally sound design, ecodesign, and sustainable design. Recently proposed development strategies are relatively more ambitious concerning the scope of what aspects should be included in the development process (Baumann et al. 2002). A continuum of development strategies can be drawn, based on the product development objectives, ranging from shallow green incremental efforts to efforts that attempt to radically redefine a product or even a product system (Johansson and Magnusson 1998). The UN Environment Program's 'Ecodesign' manual (Brezet and Van Hemel 1997; Fuller and Ottman 2004) distinguishes four development strategies, ordered in increasing environmental benefits: product improvement, product design, function innovation, and system innovation. The first strategy entails relatively small changes to existing products (e.g., non-bleached coffee filters), whereas the latter entails a radical change to 'green' the entire productive and consumptive system (e.g., car sharing programs and technologies). The development strategy is translated into product development activities by a process of prioritizing green issues (Simon et al. 2000). In practice, radically green development strategies such as system innovation are extremely rare, because green issues have to compete with other issues in the development process, which often receive a higher priority (Handfield et al. 2001).

3.4 Green Issues and Generating Value

The four challenges in environmental enactment (scope, scrutiny, commitment, and balancing) determine how green issues are incorporated in product innovation strategies. Thus, they carry consequences for the value that is generated for the firm. Specifically, the consequences of incorporating green issues can be observed in three areas: value proposition (the product innovation that is the result of the development process), value appropriation (the commercialization of the product innovation through an introduction strategy), and the resulting economic value of the product innovation (economic performance). Literature on each of these three areas of value generation in GPI strategy will be reviewed.

Greenness of Product Innovations

The result of the GPI development process is a product innovation that is to some degree 'green'. In order to see to what degree the green issues have materialized in the product we need to assess the degree in which the product is environmentally sound. This brings up the question of how to determine the greenness of a product.

Some controversy exists over what constitutes a green product, especially when trying to determine whether a given individual product is 'green' or not. The literature on the definition of green product innovations is largely normative-ethical: it prescribes how greenness ought to be determined. Most authors propose to assess the ecological impact of a product 'cradle-to-grave' through lifecycle analysis. This entails an assessment of the environmental impacts during a product's entire lifecycle from raw materials to disposal (Graedel and Allenby 1995) and requires a perspective that encompasses the whole product system (Fuller and Ottman 2004). The product system is an extension of the traditional supply chain that studies upstream participants, such as raw material extractors, manufacturers and distributors of components, midstream participants, including manufacturers and distributors of finished products, and downstream participants, such as product users and recycling firms (Fuller and Ottman 2004). From an environmental sciences perspective however, a comprehensive lifecycle analysis is fraught with many methodological pitfalls such as assumptions on how customers will use a product (Fuller 1999, pp. 65-67). Various stakeholders of the firm, such as environmental pressure groups or regulators can challenge the outcomes of a lifecycle analysis. In practice, a lifecycle analysis is infrequently applied (Lenox et al. 2000; Handfield et al. 2001). Improvement can also be achieved on merely a single green issue (e.g. recyclability, energy-saving, or waste reduction), without taking a product lifecycle system perspective (Kleiner 1991; Simon 1992).

Although lifecycle analysis is a rigorous approach to determine the greenness of a product, eventually, the greenness of a product is in the eye of the beholder. Consumer perceptions about the greenness of a product, for instance, have been known to differ significantly from 'objective' assessments (Ellen 1994; Roozen and De Pelsmacker 1998). An alternative approach is to empirically determine how various stakeholders evaluate the greenness of a product. However, the perceptions of 'what constitutes a green product' among stakeholders, including customers, remain an is-

sue for further research. The review of the literature shows that there is not one generally accepted way to determine greenness of products. Irrespective of how greenness is measured, greenness of the product innovation can be distinguished from priority of green issues during the development process. This is corroborated by the results of the theory-building case studies. In the process, green issues and other issues are balanced against each other, whereas the product innovation is the result of that process and shows how trade-offs between green and other issues were resolved to create value.

Role of Green Issues in Introduction Strategy

If a GPI development project is completed and a GPI's product characteristics are known, a firm has to determine how much emphasis is to be given to the green aspects of the product in the introduction strategy. A growing body of research on green marketing addresses this question.

Empirical research in green marketing has been mostly directed at the demand side, rather than studying the impact of environmental forces on organizational decision making in marketing (Menon et al. 1999). Drumwright (1996) is one of the notable exceptions, in that she studies how firms use an element of the marketing mix, i.e. advertising, in cause-related marketing. She showed that advertising campaigns with a social dimension are usually not very effective in achieving economic objectives such as sales, but that they are highly effective in other objectives, such as work force motivation or communicating the firm's mission. The study identifies compatibility between the company and the social cause (e.g. greening) as a precondition for success. Such compatibility is achieved through support of key stakeholders, affinity of internal and external stakeholders with the advertised cause, and a relationship of the cause with the core business.

Much of the demand-side empirical research in green marketing has been devoted to the impact of environmental involvement on consumer behavior, particularly consumer response to the marketing mix of green products. Consumer segments have been identified showing both varying levels of environmental involvement and behavior, ranging from "true-blue" greens to "basic brown" (Simon 1992; Stisser 1994; Ottman 1998). Research into the relationship between environmental involvement or concern, defined as an attitudinal construct, and buying behavior, revealed that groups with differing environmental involvement respond differently to various marketing instruments and strategies for green products, such as advertising, packaging information, product attributes, pricing, and branding. Consumers with high environmental concern are more inclined to purchase ecologically packaged goods (Schwepker and Cornwell 1991). Ecologically concerned consumers perceive products on an environmental dimension, whereas others base their perception entirely on other dimensions (Kinnear and Taylor 1973). In general, ecologically concerned consumers are more willing to make behavioral changes to limit environmental impact (Schlegelmilch et al. 1996; Roberts and Bacon 1997; Kilbourne et al. 2002). However, the consumer segment that is concerned enough to change its behavior is found to be small (Roberts 1996).

Studies on green advertising have concentrated around determining the level of greenness in advertising and the potential misleading nature of advertising claims (Kangun et al. 1991; Easterling et al. 1996). Like products, advertisements come in various 'shades of green' (Banerjee et al. 1995). Carlson, Grove, and Kangun (1993) developed a much-used classification schema for green claims: relating to the product, the process, the general image of the firm, or representing a general fact about the environment. Their study showed that product and image-related claims were most likely to be deemed misleading. Some claims can be seen as posturing, because firms sometimes use vague and ambiguous claims without any evidence of real environmental improvements (Polonsky et al. 1997). Environmentally involved consumers respond differently to green advertising claims than others (Schuhwerk and Lefkoff-Hagius 1995).

Research reveals that the sensitivity to other aspects of the green marketing mix is also determined by environmental concern. Consumers with high environmental concern are willing to pay a premium price for green products (Kassarjian 1971; Ottman 1998). This group of consumers appears to be small, however. Many segments in the electricity markets are willing to pay a small premium price for tangible improvements in air emissions, but only a few segments are willing to pay a large premium for a radical reductions achieved by renewable energy (Roe et al. 2001). Buyers have even demonstrated a negative willingness to pay for recycled products, possibly because of presumed lower functional performance (Earl and Clift 1999). Consumers who believe quality of recycled products to be higher than conventional products, and who expect a higher price for green products are more likely to buy it (Bei and Simpson 1995).

Berger and Kanetkar (1995) have shown that experience with pro-environmental behavior can strengthen the impact of environmental concern on consumer choice. Environmentally concerned consumers with relevant experience are more sensitive to well-known product attributes such as phosphate-free, but also product attributes addressing relatively 'unknown' environmental consequences. They are less sensitive to higher prices and brand names. Green consumers seem to be willing to shift their preference towards less-known brands.

Research on the demand side of green marketing suggests that management decisions in this field revolve around taking a place on a 'green targeting' continuum, ranging from targeting a deep green niche market to targeting a product at a 'brown' mainstream mass market. Following the targeting decision, marketers are faced with a green positioning decision: whether to position the product as a deep green product or to emphasize conventional product attributes. A green positioning could be achieved by an environmental performance label (or even a certified eco-label) or a green line extension (a green product under the same brand umbrella), where green consumers seem to prefer the former (Ackerstein and Lemon 1999). Green positioning is not without risks, however. Many consumers are skeptical towards green marketing (Zinkhan and Carlson 1995). Osterhus (1997) corroborates the importance of credibility and trust in pro-social marketing strategies such as green marketing. He found that trust in the marketing source moderates the relationship between attribution of consumer responsibility and behavior. Green positioning strategies can backfire, even

when targeted at a segment that attributes high levels of responsibility for the environment to itself, if consumers do not trust the marketing source. Stakeholders of the firm, most notably regulators and special interest groups, can help build consumer trust by certifying environmental initiatives, or damage consumer trust by pointing out shortcomings in a firm's environmental efforts. This means that green positioning could be less effective for companies who do not make a genuine effort into reducing the ecological burden of their products and processes (Ottman 1998). Apparantly, shareholders share these concerns. Mathur and Mathur (2000) found in an event study that announcements of green positioning result in negative stock price reactions. Performance outcomes of green marketing strategies have received little attention, however.

Effect of Including Green Issues on Economic Performance

Finally, the economic consequences of including green issues into product development need to be considered. Is the inclusion of green issues harmful to economic performance? Environmental economics has typically viewed regulatory stakeholders as the only stimulus for firms to develop green innovations. In 1991 Michael Porter claimed that stringent environmental regulations are beneficial to a country's economy (Porter 1991). "Properly designed environmental standards can trigger innovations that lower the total cost of a product or improve its value" (Porter and Van der Linde 1995a). This so-called Porter hypothesis became the focal point of many debates (e.g., Walley and Whitehead 1994; Jaffe et al. 1995). A large body of research has developed trying to determine the relationship between a firm's environmental efforts (or 'greenness') and economic performance (e.g., Hart and Ahuja 1996; Klassen and McLaughlin 1996; WBCSD 1997; Dowell et al. 2000; González-Benito and González-Benito 2005). The majority of these studies indicates that a firm's environmental efforts do not *hurt* economic performance, and relationships are typically weakly positive or absent. Some research, although not focusing on GPI exclusively, has been conducted on the relationships between stringency of environmental regulation and the occurrence of green innovation (Lanjouw and Mody 1996; Pickman 1998; Sanchez and McKinley 1998; Brunnermeier and Cohen 2003). These studies indicate a weak, sometimes moderated, but positive relationship between environmental regulation and innovation, but no or little evidence of increased economic performance.

The relationships seem to be too complex on a micro level to be adequately explained on a macro level. It is not so much the stringency of regulation or the level of environmental investment, but the mode in which balancing is achieved, e.g. through the implementation of environmental management systems, that has an effect on a firm's greenness and economic performance (Schaltegger and Synnestvedt 2002). There appears to be a need to identify patterns of responding to stakeholder issues rather than looking for a direct relationship between responding to regulatory stakeholders and economic performance. Responding to regulatory forces of GPI can take different forms, e.g. in different design strategies. Therefore, future research should study characteristics of the green product innovation strategy as mediating variables between GPI efforts and performance outcomes.

3.5 Conceptual Model

The review of the literature presented in the previous sections identified relevant literature on how green issues are integrated in product innovation strategy by identifying four challenges in environmental enactment. Subsequently, the review of the literature identified the effects of integrating green issues in product innovation strategy on greenness of the product, on the role of green issues in introduction strategy, and on economic performance. An integrative model of antecedents and outcomes of GPI strategy is proposed that incorporates these findings.

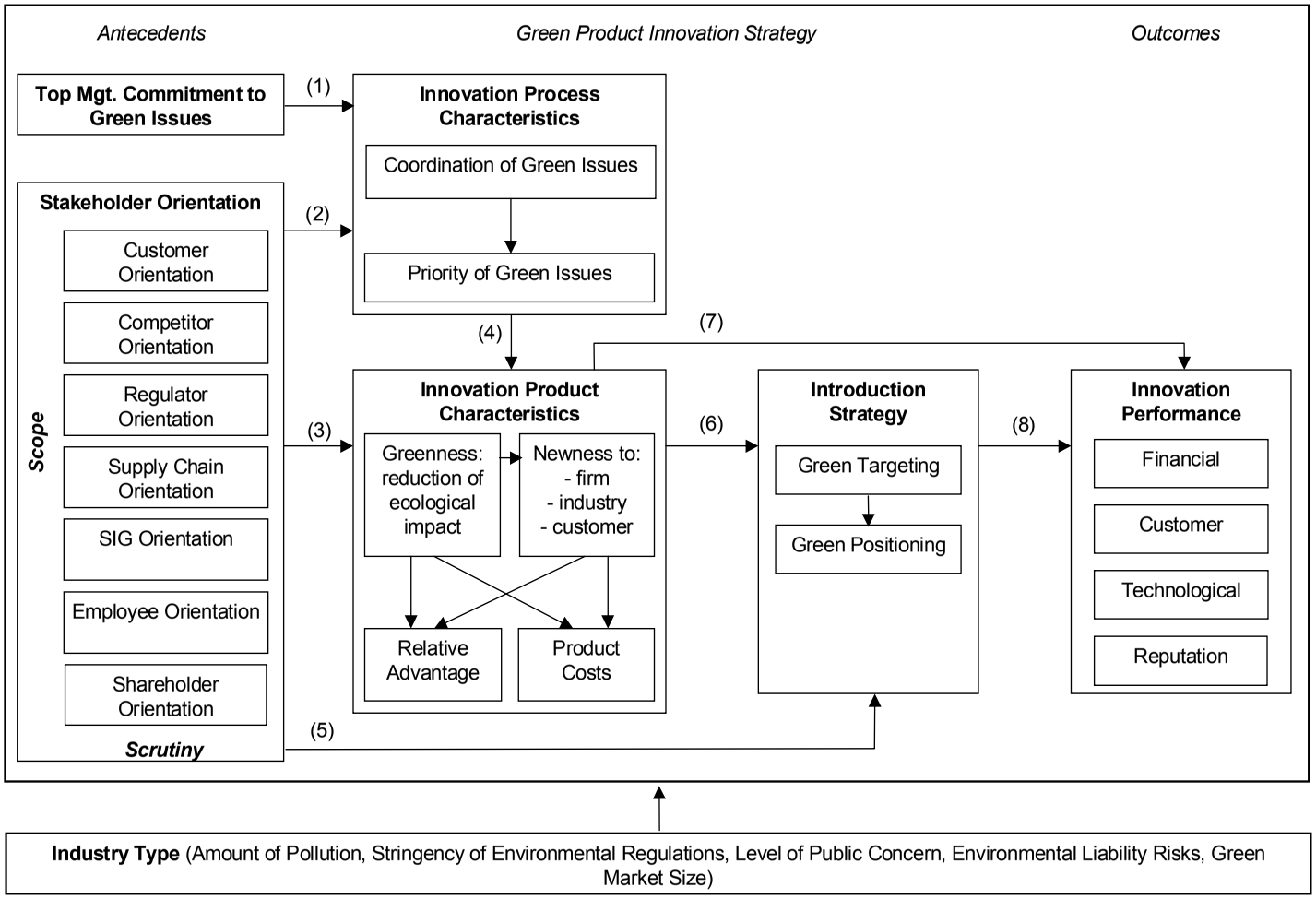
The model presented in Figure 3.1 proposes three antecedents of GPI strategy: scope of stakeholder orientation, scrutiny of stakeholder orientation, and top management commitment to green issues. Please recall that scope and scrutiny refer to the inclusiveness and quality, respectively, of information generation about market and non-market stakeholders. As such, scope and scrutiny are two elements of a larger construct, stakeholder orientation. Scope, scrutiny, and commitment have an effect on the balancing of green and non-green issues. Balancing green and non-green issues takes place in the innovation process and is not treated as an antecedent but considered to be a part of GPI strategy. In addition, GPI strategy is described by innovation product characteristics, such as greenness, and the role of green issues in introduction strategy. In this model, GPI strategy mediates the relationship between scope, scrutiny, and commitment on the one side, and innovation performance on the other. Industry type is proposed as a moderating construct. In the remainder of this chapter, the underlying rationale of the whole model will be presented first, followed by propositions that describe the relationships between constructs in more detail. The numbers above the arrows in Figure 3.1 refer to propositions about the relationships.

The model is based on the central finding that market orientation is an important determinant of both firm and innovation performance, with mounting evidence that innovation strategy is the major mechanism that accounts for this (Gatignon and Xuereb 1997; Han et al. 1998; Han et al. 2001; Frambach et al. 2003; Leskiewicz Sandvik and Sandvik 2003; Deshpande and Farley 2004). Instead of market orientation, however, a broader construct, stakeholder orientation, is proposed. The broad conceptual development of the model will be discussed first by conceptualizing each construct in the model.

Top Management Commitment to Green Issues

The theory-building cases identified commitment in green policy as an antecedent to GPI strategy. The review of the literature on environment enactment identified, more precisely, top management commitment to green issues to be an antecedent of GPI strategy. It is conceptualized as the degree in which the top management of a firm has created norms for pro-active environmental management. This is consistent with the stage models found in the literature in environmental management. Top management commitment is demonstrated by creating a sense of importance of green issues by means of a mission statement, internal rules of con-duct, or communiqués. It establishes norms for how pro-active the environmental management of a firm should be (Maignan and Ferrell 2004).

Figure 3.1: Conceptual Model of Antecedents and Outcomes of GPI Strategy



Stakeholder Orientation as a Key Antecedent

Stakeholder orientation is proposed to be a key antecedent, that accounts for the influence that market and non-market stakeholders exert on GPI strategy. Stakeholder orientation is an extension and adaptation of the market orientation construct (Kohli and Jaworski 1990; Narver and Slater 1990), introduced in the marketing literature by Greenley and Foxall (1996; 1998). Following the market orientation concept, a stakeholder orientation reflects the organizational information-processing of a firm. As such a stakeholder orientation is (1) the systematic gathering of information on stakeholders, both present and potential, (2) the systematic analysis of the information for the purpose of developing stakeholder knowledge, and (3) the systematic use of such knowledge to guide strategy recognition, understanding, creation, selection, implementation and modification (cf. Hunt and Morgan 1995, p. 11). Following Hunt and Morgan (1995) and Gatignon and Xuereb (1997), interfunctional coordination is not included as a component of stakeholder orientation. It is seen as a mechanism to implement a stakeholder orientation, rather than a defining component (Ingenbleek 2002, p. 124).

The scope dimension of stakeholder orientation represents an emphasis on monitoring *all forces* relevant to a firm, which can be traced back to seminal work on the market orientation construct. Kohli, Jaworksi, and Kumar (1993) contend that although customer and competitors are important stakeholders, a firm must balance the interests of these two stakeholders with those of other external stakeholders (e.g. regulatory). Furthermore, Slater and Narver (1995 p. 68) contend that including only customers and competitors in market orientation could hamper the opportunities for generative learning in organizations. They conclude that "[…] the scope of market orientation must include all stakeholders and constituencies that (1) possess, or are developing, knowledge that has the potential to contribute to the creation of superior customer value or (2) are threats to competitive advantage."

Stakeholder orientation is a nascent construct and is not always operationalized in a similar vein as above. Berman et al. (1999) measure stakeholder orientation by specific management actions to address stakeholders' interests. Following the analogy with the market orientation construct, stakeholder orientation in the model is operationalized as an organizational information-processing construct, rather than an action-oriented construct. The organizational information-processing perspective takes into account the finding that many stakeholders' interests are incorporated in GPI without explicitly involving them, but rather by management judgment on stakeholders' interests (Polonsky and Ottman 1998). Thus stakeholder orientations are an appropriate conceptualization to explain the various driving forces for GPI. Relevant stakeholders have been identified in the research into driving forces of GPI. Therefore, the model proposes customers, competitors, regulatory stakeholders, supply chain partners, special interest groups (SIGs), employees and shareholders (or owners in case of lack of a shareholder structure) to be relevant stakeholders for GPI (cf. Polonsky and Ottman 1998). Top management, which has often been identified as an important internal stakeholder, is excluded because top management is the group of actors adopting a stakeholder orientation or not and as such not subjected to the monitoring implied by a stakeholder orientation. The scope of stakeholder orientation re-

flects to what degree each of seven possible stakeholder groups is included: customers, competitors, regulators, supply chain member, SIGs, employees, and shareholders.

Customer and *competitor orientation* are familiar components from the market orientation construct. *Regulator orientation* is the degree to which a firms gathers, analyzes, and uses information about regulatory stakeholders. Regulatory stakeholders are all stakeholders that are directly involved in designing, implementing or communicating regulations, such as governments at all levels, trade associations, and industry networks (cf. Henriques and Sadorsky 1999). *Supply chain orientation* deals with information processing about supply chain partners. These include both upstream and downstream constituents in the firm's supply chains (excluding customers), e.g. all direct and indirect suppliers and distributors. The impact of suppliers on new product development has gained little interest from researchers, but exploratory work shows that firms that involve purchasing managers in NPD as an interface with suppliers have higher NPD performance (Nijssen et al. 2002). Likewise, distributors have an impact on innovation strategy because of their involvement in NPD or their ability to make or break a new product. Because environmental effects of products exert themselves in all shackles of the supply chain, GPI strategy should be more concerned with supply chain partners than any other innovation strategy. *SIG orientation* is the degree in which the firm collects, analyzes and uses information about special interest groups, such as community groups, environmental organizations, and lobby groups. These stakeholders hold the potential to mobilize other stakeholder groups such as customers and regulators, and are sometime involved in GPI strategies (Westley and Vredenburg 1991; Neuner 2000). Adopting an *employee orientation* involves monitoring needs and opinions of employees, e.g. on safety and health aspects. Safety and health aspects are often intertwined with environmental issues, thus entering an employee perspective in GPI strategy. Finally, a *shareholder orientation* serves to acquire, process, and act upon information from the firm's owner or owners.

The model proposes that scope and scrutiny are distinct components of stakeholder orientation, based on the review of the literature on environmental enactment in product innovation strategy. Scope involves the number of stakeholders in a stakeholder orientation, and reflects whether stakeholders that place a heavier weight on green issues are included in information gathering, analysis, and use. Scrutiny involves the degree to which information is gathered, analyzed, and used that enables the firm to be forward-looking and proactive. The extant literature on stakeholder orientation has only dealt with the 'scope' component of the construct. The 'scrutiny' component has only been addressed in the market orientation literature, and has not been applied to other, non-market stakeholder groups.

Characteristics of GPI Strategy as Mediators

GPI strategy is conceptualized by innovation process characteristics, innovation product characteristics, and introduction strategy, and mediates the relationship between stakeholder orientation and performance. The market orientation literature provides a rationale for this mediation. Extant research on the market orientation - performance relationship has yielded somewhat mixed results, dependant on the measure

of performance used (Narver and Slater 1990; Jaworski and Kohli 1993; Slater and Narver 1994). Evidence is accumulating that the relationship is mediated by innovation, which explains the mixed results. Han et al. (1998) have shown that the relationship is mediated by the type of innovation. Gatignon and Xuereb (1997) found an effect of customer, competitor, and technological orientation on innovation characteristics en route to performance. Han et al. (2001) found market orientation to increase technological orientation en route to radical product portfolios, en route to performance. This chapter proposes a mediation similar to above studies, for GPI. The stakeholder concept has been suggested to improve R&D project management (Elias et al. 2002). Stakeholder orientations also show a direct association with green management strategy (Henriques and Sadorsky 1999). Thus, GPI strategy is proposed to mediate the relationship between stakeholder orientation and performance.

The review of the literature on balancing green and non-green issues identified two characteristics of the innovation process: coordination of green issues and priority of green issues. Hence, these two characteristics are used to conceptualize innovation process characteristics. Product innovation characteristics are conceptualized in the same way as forwarded in the preliminary research framework in Chapter 1: greenness, newness, relative advantage, and product costs. This conceptualization extends the specification of the product characteristics of Gatignon and Xuereb (1997), in which product newness is proposed to be an antecedent product characteristic for other product characteristics. Product newness is specified as newness to the firm, the industry, and/or the customer (Garcia and Calantone 2002). The conceptual model in this chapter adds greenness as a product characteristic, and specifies greenness and newness as underlying GPI product characteristics. The level of greenness determines the newness, relative advantage, and product costs of the product. In the case of a very ambitious green approach (a system redesign), newness, product costs and relative advantage are likely to be affected. Moreover, newness affects relative advantage and product costs (Gatignon and Xuereb 1997).

Introduction strategy is conceptualized using two characteristics: the degree of green targeting and the degree of green positioning. The research on green marketing reviewed in a previous section of this chapter suggests that introduction strategy be operationalized in terms of whether or not a green consumer segment is targeted and the greenness of the positioning of the green product. The theory-building case studies point in the same direction. A green targeting strategy is defined as a niche strategy that focuses on a segment that is greener than mainstream segments. It is therefore relative to the average level of environmental consciousness in an entire market. The greenness of the positioning represents the degree in which green aspects of the product are emphasized in branding and other communications about the product innovation.

Innovation Performance

Similar to the initial findings on the market orientation-performance relationship, research has produced mixed results for the stakeholder orientation-performance relationship. Greenley and Foxall (1998) discovered no relationship with performance as a one-dimensional construct, but they did find that the various types of stakeholder

orientations are associated with different performance measures. By conceptualizing innovation performance by different performance measures, the proposed model integrates this finding. The proposed model includes other than financial performance measures, thus echoing the spirit of stakeholder theory, which contends that performance should also be measured reflecting on various stakeholders' interests. Including a measure of stakeholder perceived performance like stakeholder reputation is a logical consequence of applying a stakeholder perspective to corporate social responsibility issues, like GPI (Carroll 1979; Menon and Menon 1997; Murray and Vogel 1997; Maignan and Ferrell 2004). Pujari et al. used a construct similar to reputation, 'environmental image', together with 'reduced environmental impact' to form a construct they called 'ecoperformance' and found relationships with elements of GPI strategy.

The outcomes of a product development project are by nature multidimensional. Innovation performance has been found to have three dimensions (Griffin and Page 1993; Griffin and Page 1996): financial (e.g., the degree to which a project met profit goals), customer (e.g., market share), and technological (e.g., degree to which a project provides a competitive advantage). Furthermore, Griffin and Page (1996) have made a compelling argument that the appropriate way of measuring performance for a product development project depends on the project. Whether a product development project is a success depends on the objectives for the project. The notion of 'different measures for different projects' can be extended to GPI projects, which are developed during a 'balancing act' to satisfy the possibly diverging interests of a complex set of stakeholders. To determine to which degree the set of stakeholders' interests have been met, the impact of the GPI on the reputation with the various stakeholders should be established. Therefore, 'reputation with stakeholders' is proposed as a fourth performance dimension, alongside 'financial performance', 'customer performance', and 'technological performance'.

The performance dimensions 'technological performance' and 'reputation with stakeholders' are more elusive than financial and customer performance, but they may be all the more relevant for GPIs. The theory-building case studies yielded similar findings. Anecdotal evidence suggests that firms sometimes develop GPIs with an objective to have a 'showcase' product, demonstrating technological prowess and/or trying to earn a reputation with environmentally concerned stakeholders. The Husqvarna solar mower, mentioned in the introduction in Chapter 1, is such an example (Bragd 1997).

Moderation by Industry Type

Many relationships in the model are moderated by 'Industry Type', as introduced by Banerjee et al. (2003). They dichotomize industries on the basis of environmental impact into 'high' and 'moderate' environmental impact. Environmental impact can be determined by exploring differences on four dimensions: amount of pollution, level of public concern, stringency of environmental regulations, and environmental liability risks. The theory-building case studies suggest green market size as an additional industry-related characteristic.

The main rationale for including industry type as moderating the relationship between stakeholder orientation and GPI strategy, as well as the relationship between GPI strategy and performance is found in Banerjee et al. (2003), and Menon and Menon (1997), respectively. Banerjee et al. (2003) showed that industry type moderates the relationship between driving forces of greening on one side and the firm's emphasis on greening and green strategy implementation in functional strategies on the other side. More specifically, they found that, in high environmental impact industries, regulatory forces influenced the degree in which managers perceived environmental issues to be crucial for the firms financial health. In moderate environmental impact industries, competitive advantage was the driving force for managers to perceive environmental issues as being crucial for financial health. Menon and Menon (1997) propose that the relationship between green marketing strategy and performance is moderated by 'industry reputation'. The impact of a firm's green efforts on its performance has indeed been found to vary by industry (Lefebvre et al. 2003). Industry type as moderator is proposed to be of crucial importance for understanding why some GPI's are successful and others are not, and will be elaborated upon further on in this chapter when presenting specific propositions.

The nature of the moderation deserves special attention. It is likely that in some relationships the moderator not only changes the strength of the relationship but even the valence. In an industry in which environmental issues are of very little impact, developing a 'deep-green' product and applying green targeting and positioning as introduction strategy for that product, might have negative performance consequences, whereas in a high environmental impact industry such may be done with positive performance consequences. Therefore, the moderation could manifest itself as a cross-over interaction (Baron and Kenny 1986) or a homologizer (Sharma et al. 1981). Greenley and Foxall (1998) indeed found a similar moderation effect when they discovered the relationships between stakeholder orientations and various performance measures to be moderated by competitor hostility, market turbulence, and market growth. Moreover, they found relationships between stakeholder orientations and performance to be non-monotonic, that is, the moderator changes the sign of the relationship. The exact shape of many of the moderation effects in the conceptual model remains largely an empirical issue for now.

3.6 Propositions

The conceptual model presented in Figure 3.1 proposes eight relationships between the identified constructs. Each relationship will be specified by forwarding propositions. The numbers of the propositions correspond with the numbers above the arrows in the figure.

The model proposes that top management commitment to green issues has an impact on coordination of green issues in the development process. Cross-functional coordination can be achieved through various organizational mechanisms for product development (Griffin and Hauser 1996). The relative importance of the environmental management function or environmental champion in the organizational mechanism is determined by the degree of top management support for green issues. Top management support for including green issues in product development is associated with a

greater role for environmental managers in new product development projects (Aragón-Correa et al. 2004), and more attention for the environmental impact of a product innovation, anywhere in the supply chain (Pujari et al. 2004). The greater presence of the environmental management function and increased attention for green issues both lead to more coordination of green issues. Hence, the following proposition is forwarded:

> **Proposition 1a:** Top management commitment to green issues increases coordination of green issues in the product development process.

Similarly, top management commitment to green issues has an impact on the priority of green issues. From the innovation management literature we know that top management exerts influence on prioritizing time-to-market versus product quality (Anthony and McKay 1992; Brown and Eisenhardt 1995; Henard and Szymanski 2001). The model proposes that top management also exerts influence on the priority of green issues. Green issues generally receive a lower priority than non-green issues in the product innovation process (Handfield et al. 2001), but the theory-building case studies have shown that this can change dramatically if top management is very highly committed to green issues. Top managers that are highly committed to green issues will improve the awareness of green issues among participants in the development process and ensure that green issues receive enough priority.

> **Proposition 1b:** Top management commitment to green issues increases priority of green issues in the product development process.

Innovation process characteristics are affected by the market orientation of the firm. Market orientation leads to more cross-functional teamwork (Atuahene-Gima 1996). Just as market orientation creates a shared understanding of and common beliefs about market issues, stakeholder orientation enables crossfunctional coordination with regard to stakeholder issues. Maignan and Ferrell (2004) argue that stakeholder orientation is an antecedent to the identification of stakeholder issues, and thus determines the degree in which a stakeholder issue is dealt with. Therefore, stakeholder orientation, as an expansion of the market orientation construct, is proposed to influence cross-functional integration. Stakeholder orientation is thought to determine the extent to which the perspective of a stakeholder is present during the NPD process and the impact that all green driving forces together have on product development. This relationship holds for inclusion of a stakeholder group in stakeholder orientation (scope), as well as the quality of information about a stakeholder group (scrutiny). Information about green issues is easier recognized, analyzed and acted upon if more stakeholders are monitored with scrutiny. Because of the boundary spanning function of the environmental management business function, it is more likely to be included in a GPI development process if information about many stakeholders is to be included. Some stakeholder orientations, like a regulator orientation or SIG orientation, are more likely to increase 'greening' than others (Buysse and Verbeke 2003). The relative importance of each orientation and the differential impact of each orientation are both empirical issues and left unspecified.

> **Proposition 2a:** Scope and scrutiny of stakeholder orientation increase coordination of green issues in the product development process.

Generating information about stakeholder groups will not only increase coordination of green issues, but will also raise the priority of green issues during the development process. This holds for both scope and scrutiny. When managers are provided with information about competitors, competitive objectives receive a higher weight in managerial decision-making (Armstrong and Collopy 1996). Individuals that engage in broad environmental scanning, i.e., that employ a wide scope, are more likely to become product champions and change the priorities in the product development process (Howell and Shea 2001). Thus, the mere presence of information about a stakeholder affects prioritizing in the development process. Also, the quality of the information affects prioritizing. Better quality information is perceived as being more useful (Moenaert and Souder 1996), and therefore receives a higher weight in product innovation decisions. Because both presence and quality of information about stakeholder groups affects the priority that a stakeholder issue receives, the following proposition is forwarded:

> **Proposition 2b:** Scope and scrutiny of stakeholder orientation increase priority of green issues in the product development process.

Please note that above propositions make the implicit assumption that some stakeholder group has or will put green issues relating to the firm's industry on its agenda. Only then will increasing the scope and/or scrutiny lead to green issues playing a larger role in the development process. If, however, stakeholder groups in a given industry do not recognize green issues as important, scope and scrutiny in stakeholder orientation will not lead to the predicted effects on innovation process characteristics. Stakeholder groups are much more likely to include green issues in their agendas in industries with a high environmental impact (Banerjee et al. 2003). In these industries, a high stakeholder orientation will more likely lead to an increased need for cross-functional coordination between environmental and other business functions. Therefore, a moderator effect is proposed.

> **Proposition 2c:** The positive effect of stakeholder orientations on innovation process characteristics is greater in high environmental impact industries than in moderate environmental impact industries.

GPI product characteristics are also affected by stakeholder orientation. Information about stakeholders' green interests is more likely to be reflected in specific design decisions if a stakeholder orientation is high. We know about market orientation that it has an effect on product characteristics (Gatignon and Xuereb 1997; Lukas and Ferrell 2000; Han et al. 2001; Hult et al. 2004). From the literature review we know that stakeholder groups are responsible for several driving forces that lead to greener products. If the scope of stakeholder orientation is wide, more driving forces of GPI exert their influence, thus increasing the likelihood of greener products. From the literature review we also know that scrutiny in stakeholder orientation provides opportunities for more proactive green management practices. If scrutiny in stakeholder orientation is high, future green needs are anticipated by developing greener products. Building on these findings, the following effects are proposed:

> **Proposition 3a:** Scope and scrutiny of stakeholder orientation increase the greenness of the green products that are developed.

Market orientation has been found to have a positive effect on newness (Gatignon and Xuereb 1997; Lukas and Ferrell 2000; Han et al. 2001; Hult et al. 2004). It is, however, not clear how scope and scrutiny in stakeholder orientation affect newness. Scrutiny will most likely have a positive effect on newness, because scrutiny enables future needs to be reflected in the product (Narver et al. 2000; O'Connor and Veryzer 2001). Regarding scope, one can argue that the inclusion of more stakeholders in information generation improves the chances of coming up with a novel product idea, although this remains an empirical issue.

> **Proposition 3b:** Scope and scrutiny of stakeholder orientation increase the newness of the green products that are developed.

The relationship between stakeholder orientation and product characteristics is proposed to be stronger in industries characterized as having high environmental impact, similar to the moderation effect in proposition 2c. In high environmental impact industries, scope and scrutiny in stakeholder orientation increase the potential to uncover present and future green issues, which is reflected in the product innovation's characteristics.

> **Proposition 3c:** The positive effect of stakeholder orientation on innovation product characteristics is greater in high environmental impact industries than in moderate environmental impact industries.

Innovation process and product characteristics are related. The way in which green and non-green issues are balanced during the development process determines the greenness of the product innovation. A high degree of cross-functional coordination leads to products with less environmental impact (Pujari et al. 2003). If a lot of coordination takes place surrounding green issues, it becomes less likely that a green issue is overlooked and left undealt with. For instance, if the environmental management function is highly involved in the GPI development process, the influence of the environmental management function ensures that ecological improvements are taken into consideration. The presence of an environmental champion has a similar effect.

> **Proposition 4a:** Coordination of green issues in the product development process increases greenness of the green products that are developed.

If the priority that is attached to green issues during the development process is high, it is much more likely that a green product will materialize from the GPI development process, because trade-offs between green and non-green issues are more likely to be resolved to the advantage of green issues. Faced with a trade-off between functional performance and a green issue, as was for instance observed in the theory-building case studies, the outcome of the development process is greener if the green issue receives more priority.

> **Proposition 4b:** Priority of green issues in the product development process increases greenness of the green products that are developed.

Scope and scrutiny in stakeholder orientation have an impact on greening the process and product characteristics, and also have an impact on the role of green issues in introduction strategy. Just like market orientation increases the proficiency of activities

in the introduction strategy (Atuahene-Gima 1995; Langerak et al. 2004), stakeholder orientation increases the proficiency of incorporating green issues in introduction strategy. Moreover, information generation about green issues creates awareness and a sense of importance regarding green issues. A wide scope in stakeholder orientation provides a firm with many sources about greening issues in society and thus enable a firm to identify and target a green customer segment sensitive to these issues. Heightened awareness of green issues within the firm increases the understanding of present needs of a green customer segment. Similarly, higher scrutiny in stakeholder orientation increases the understanding of future needs of a green customer segment, thus increasing the opportunities for targeting such a segment.

> **Proposition 5a:** Scope and scrutiny of stakeholder orientation increase the degree of green targeting.

Scope and scrutiny in stakeholder orientation influence the degree of green positioning in a similar manner as they do with green targeting. Scope in stakeholder orientation enables a firm to identify more green issues that can be used in positioning, thereby enhancing the likelihood that one or more green issues are used as a key positioning attribute. Scrutiny in stakeholder orientation enhances the firm's understanding of current and future green issues, thereby providing a better underpinning for green positioning. High-quality information about green issues can convince marketing decision makers to opt for a highly green positioning.

> **Proposition 5b:** Scope and scrutiny of stakeholder orientation increase the degree of green positioning.

The effects specified above hold only in contexts in which green issues are important to stakeholder groups, as found in high environmental impact industries (Banerjee et al. 2003). Otherwise, even a stakeholder orientation with a large scope and high scrutiny might not identify a green segment large enough to warrant a green targeting and/or positioning strategy. Moreover, if green issues do not play any important role in an industry, a wider scope and higher scrutiny in stakeholder orientation lead to a *less* green introduction strategy, because the firm is better able to recognize the absence of green issues. Therefore, a moderating effect of industry type is expected, that possibly even changes the sign of the relationship described in propositions 5a and 5b.

> **Proposition 5c:** The positive effect of stakeholder orientation on introduction characteristics is greater in high environmental impact industries than in moderate environmental impact industries.

Furthermore, introduction strategy is related to the characteristics of the product being introduced. If a deep green product has been developed, this can enlist support of important stakeholders such as regulators (e.g., through labeling schemes) or SIGs, allowing the firm to follow a green targeting strategy (Drumwright 1996). The danger of a negative backfire is much less prominent in such case. Furthermore, a greener product increases the perceived viability of green targeting to managers, making it more likely that a green customer segment plays an important role in the targeting

strategy. A deep green product is much more likely to be adopted by a deep green segment than any other segment.

> **Proposition 6a:** Greenness of new products increases the degree of green targeting.

If a deep green product has been developed, a firm will seek ways to extract value from the extra efforts that were made to improve the greenness of the product. By highlighting the green aspects of the product in a green positioning strategy, marketing decision makers will attempt to redeem the costs that were incurred for improving greenness. The reverse is also true: managers will avoid positioning their products as green, if in fact the product does not offer large improvements regarding green issues. Positioning a non-green product as green is known in the literature as 'greenwashing' and will be perceived by managers as a risky strategy that is likely to backfire (Zinkhan and Carlson 1995; Ottman 1998).

> **Proposition 6b:** Greenness of new products increases the degree of green positioning.

The role of green issues in introduction strategy depends on industry type. In a high environmental impact industry, green issues are relevant and meaningful for customers (Banerjee et al. 2003) and green market size is bigger. In such an industry, communication about the improved greenness of the product is less likely to fall on deaf ears (Hoeffler and Keller 2002). Therefore, a deep green product in a high environmental impact industry is introduced with greener targeting and positioning than a deep green product in a moderate environmental impact industry. The opposite perspective is also possible. If, in a high environmental impact industry, most products are deep green and have a very green targeting and positioning, a firm is more likely to have less green targeting and positioning because that would yield more competitive advantage in such an industry. Therefore, the direction of the moderation is an empirical issue and left unspecified in the following proposition:

> **Proposition 6c:** The effect of greenness of new products on introduction characteristics is different in high environmental impact industries from moderate environmental impact industries.

Innovation product characteristics have been shown to significantly impact new product development performance and have received a lot of attention in the literature (Montoya-Weiss and Calantone 1994; Henard and Szymanski 2001). Relative advantage, in particular, exhibits a strong positive relationship with innovation performance. Extending the specification of Gatignon and Xuereb (1997), the conceptual model proposes greenness to impact newness, relative advantage, and product cost, and to exhibit a positive relationship with innovation performance. If the Porter Hypothesis, which states that strict regulation leads to product innovations with higher value or lower cost, is correct, then greenness has a positive impact on financial, customer, and technological performance. Given the evidence in favor of the Porter Hypothesis (Klassen and McLaughlin 1996; González-Benito and González-Benito 2005), a positive relationship between greenness and the three 'traditional' performance dimensions is proposed. Presuming that all stakeholders positively evaluate ef-

forts to come up with innovations that have reduced ecological impact, greenness will also have a positive impact on reputation with stakeholders. Developing greener products improves the firm's reputation with customers, for instance (González-Benito and González-Benito 2005). Therefore, greenness is proposed to have a positive impact on all four innovation performance measures.

> **Proposition 7a:** Greenness increases financial, customer, technological innovation performance, and reputation with stakeholders.

Some authors suggest a trade-off between greenness and consumer or financial performance: 'deep green' products are possibly only interesting for a green niche market because the high level of greenness, which exceeds the requirements made by customers or regulators, may lead to extra costs or reduced functionality (Wong et al. 1996; Chen 2001). A less-green product might be preferable, even from a macro-ecological perspective: environmental protection might be more served by a 'less-green' product that appeals to a greater market than a 'deep green' product targeted at a small niche. From this perspective, a less green product is more profitable than a very green product if green market size is small (Chen 2001). In moderate environmental impact industries, the market for a deep green product is restricted to a small niche, whereas in a high environmental impact industry, with stringent regulation, high level of public concern, and high environmental liability risks the market for a deep green product is larger. Another perspective predicts the opposite, however. In an industry with very stringent regulations, the degrees of freedom for an innovating firm might be small and the differences in greenness between competitive products barely noticeable. In such an industry context, greenness will not have a significant impact on innovation performance, but other product characteristics – relative advantage and product costs – will contribute more to innovation performance. Given the two contradictory perspectives, the impact of greenness on innovation performance is proposed to show moderation, but the direction of the moderation is left unspecified.

> **Proposition 7b:** The effect of greenness on innovation performance is different in high environmental impact industries from moderate environmental impact industries.

Finally, green targeting and positioning is proposed to have an impact on innovation performance. For GPIs, a green targeting and positioning strategy seems the optimal choice, as it provides an opportunity to extract value from the efforts in developing a green product. The product attributes of a GPI appeal more to a green customer segment, thereby making a green targeting strategy more successful that a non-green targeting strategy. Also, a green positioning strategy is more effective for a GPI than a non-green positioning, because it highlights the unique features of the product. Therefore, green targeting and positioning is predicted to have a positive impact on the three 'traditional' performance measures. Green targeting and positioning contributes to reputation, too. Analogously to the effect of greenness on reputation with stakeholders, it is argued that green targeting and positioning strategies will not go unnoticed with environmentally concerned stakeholders and will evoke a positive attitude. Company advertising campaigns addressing social issues are particularly successful in achieving non-economic objectives such as communicating the company's mission, motivating employees, and reputation (Drumwright 1996). Therefore, green tar-

geting and positioning are proposed to have a positive impact on reputation with stakeholders.

> **Proposition 8a:** Green targeting and positioning increases financial, customer, technological innovation performance, and reputation with stakeholders.

The relationship between introduction strategy and performance is proposed to show moderation by industry type. In a high environmental impact industry, the customer segment receptive to green targeting and positioning strategies is relatively large. Therefore, the performance impact of a green targeting and positioning strategy in a high environmental impact industry is expected to be higher than in a moderate environmental impact industry. As with propositions 6 and 7, a contradictory perspective is also possible. In a highly regulated industry (high environmental impact), a highly green targeting and positioning strategy is less effective than in an unregulated industry, because customers are forced into adoption of green technology. A product that moves beyond compliance and is positioned as such, is less likely to achieve high performance under such circumstances, whereas in an unregulated industry a product that is positioned to be greener than mainstream, might be attractive to a green segment. Anecdotal evidence offers some support for this perspective, showing that firms who have engaged in sizeable GPI development efforts that materialized in green products, chose not to target a green market segment (Wong et al. 1996).

> **Proposition 8b:** The effect of green targeting and positioning on innovation performance is different in high environmental impact industries from moderate environmental impact industries.

3.7 Conclusion

By developing the theoretical model in this chapter, all four themes identified in the theory-building cases have been acknowledged and integrated into a model that is grounded in the extant product innovation management literature. First, the specific nature of GPI strategy is accounted for by recognizing the importance of top management commitment to green issues, by considering coordination and priority of green issues in the development process, by including greenness as a product characteristic, and by focusing on the role of green issues in introduction strategy. Second, a broadening of the market orientation is proposed by recognizing scope and scrutiny in stakeholder orientation. Third, the role of market environment is acknowledged by including industry type (including green market size) as a moderating variable for many of the relationships. Fourth, innovation performance has been broadened by including reputation with stakeholders. The resulting model reflects differences and similarities with conventional product innovation strategy by extending the market orientation - product innovation - performance perspective.

The model and propositions are mainly untested, or partially investigated at best. The remainder of this dissertation is devoted to testing the model. Before testing, we need to realize the limitations in applicability of the model. An important underlying assumption of the model is that, in proposing stakeholder orientation and top management commitment to green issues as antecedents to GPI performance, high scope and scrutiny in stakeholder orientation and high commitment are not commonplace. A

market orientation can produce a comparative advantage only if it is rare among competitors (Hunt and Morgan 1995); similarly, stakeholder orientations are only translated to performance by GPI strategy if including the stakeholder topics into strategy yields a competitive advantage. If all firms in an industry were to have the same stakeholder orientation and adopt the same environmental standards for their products, the model cannot be used to explain performance. Also, the model assumes that a minimum level of scope and scrutiny is met. For instance in a somewhat regulated industry, a certain level of regulator orientation is a necessary precondition to remain active in the market.

For management and public policy practice, the model can make several contributions. It can shed light on 'puzzles' that present themselves in the market place such as firms that spend substantive amounts of resources on GPI development and choose not to communicate this to their customers, like Philips (Hikspoors et al. 1994). One explanation is that the products are developed with the objective of gaining competitive advantage in technology expertise, aimed at the long future, or that the products are developed as 'showcase' products to enhance reputation. Industry type as a moderating variable can also be an explanation for such 'puzzles'. In a regulated industry a strong regulator orientation will sooner lead to proactive radical green product development but positioning is likely to be on non-green attributes. Furthermore, if empirically tested, the model can deliver a substantial contribution to the debate about the Porter Hypothesis, possibly showing that a "win-win" situation is possible in certain industries and employing a strong stakeholder orientation.

Including stakeholder orientation in models of product innovation is a conceptual advance that allows researchers to study how social issues find their way in product innovation through market and non-market stakeholders. It is a first step towards a theory on integrating corporate social responsibility in product innovation strategy. Although this paper applies to GPIs, the model can easily be adapted to apply to other social issues in product innovation strategy. In recent years, many of such societal issues have been put on the public agenda by stakeholder groups: health issues in new food products (for instance to fight obesity), genetically engineered ingredients in food products, labor conditions attached to the manufacturing of some innovations, developing products for vulnerable customers or markets in less developed countries, and so on. By theory development along the lines of this chapter, corporate social responsibility issues, which are increasingly relevant to practitioners and the public alike, will no longer be largely ignored in the extant product innovation management literature.

Chapter 4: Methods for the Theory-Testing Case Studies

Chapters 2 and 3 cover the theory-building stage of the research, and resulted in a conceptual model and propositional inventory. This chapter describes the methods for the third stage of the research, theory-testing. Because theory-testing using cases requires a rigorous and well-designed methodological approach, methods for this stage are discussed in detail.

4.1 Research Strategy

As outlined in Chapter 1, the third stage in this research involves theory-testing using a multiple-case study approach. The theory-testing stage serves two functions: (1) to verify the theoretical constructs proposed in the theoretical model, and (2) to test causal links between constructs in the theoretical model. These two functions are intertwined, because theoretical constructs and the causal links between them are not developed in isolation of each other. Theoretical constructs are not included in a piecemeal fashion into a model, but a theoretical model is a *system* of linked constructs (Hunt 1991, pp. 169-70). Therefore, theoretical constructs and causal links are subjected to theoretical testing simultaneously.

As explained in the outline of the thesis in Chapter 1, this study takes the stance that theory-testing through case research is possible to achieve by using the principle of theoretical generalization (Hillebrand et al. 2001). This principle will be discussed in more detail below, focusing on the methodological consequences for the theory-testing stage of this study. Theory-testing implies demonstrating the generalizability of the theoretical model. Given the small number of cases that is usually investigated in case research, generalizability cannot be demonstrated by relying on probability theory. Yet, generalizability can be achieved using case research when relying on theoretical generalization. Theoretical generalization is defined as "declaring the results of case research valid for a larger population on the basis of both *structural similarity* and *logical argumentation*" (Hillebrand et al. 2001, p. 653, emphasis added).

Structural similarity refers to the principle that the results of a case study will hold for any other identical situation. An example in the context of this study will explain this. Assume that a set of antecedents, being scope and scrutiny in stakeholder orientation and top management commitment to green issues is observed to coincide with a certain level of priority being given to green issues in a case study in a certain industry. The principle of structural similarity dictates that, if the exact same set of antecedents is observed in another project in the same industry, this will lead to the exact same level of priority for green issues in the project. Relying solely on structural similarity yields two problems. First, any finding is only generalizable to a very small set of identical situations, thus seriously limiting the usefulness of the theory, unless one is willing to relax the conditions when two situation are 'identical' or one is able to conduct a very large number of case studies. Second, the findings in the case might be an anomaly of some sort, perhaps due to unobserved variables. Therefore, declaring the results of a single case study generalizable based on the argument of structural

similarity is insufficient to convincingly demonstrate that the theoretical model is generalizable for all GPIs.

The principle of structural similarity is to be complemented by the principle of logical argumentation. The causal links between the theoretical constructs need to be supported by providing as much underlying logic as possible. This is very similar to the approach in experimental research in the social sciences, in which the results of one or a few experiments have to be supported by a logical explanation to be plausible (Yin 1994; Hillebrand et al. 2001). This logical explanation may be supplied by formerly accepted theories, arguments provided by the researcher(s), and empirical data. The qualitative nature of case research offers the advantage that informants give a detailed explanation of why a GPI project turned out the way it did. If the data collection is performed using a well-crafted protocol, the data can either contribute to establishing theoretical causal relationships or fail to find support. Therefore, the research strategy in the theory-testing stage must be well suited to detect causal relationships and their underlying mechanisms. In essence, the research strategy must be capable of answering the question, '*why does construct A influence construct B?'* rather than just showing that a level in construct A *coincides* with a certain level in construct B.

Now that the importance of the logical argumentation behind a causal relationship has been established, let us turn to the question how to assess the causality of a relationship. The four conditions proposed by Hunt (1991) for classifying an explanation as causal provide guidelines for the design of the study. In order to determine a causal relationship, four conditions are needed: temporal sequentiality, associative variation, non-spurious association, and theoretical support (Hunt 1991, pp. 86-88).

1. *Temporal sequentiality* holds if the causing construct precedes the resulting construct in time. In general, case research is relatively well-suited to determine temporal sequentiality, because the case researcher is usually able to reconstruct the 'episodes' related to the phenomenon under study and thus determine the timeline of events (Stake 2000). The best evidence for temporal sequentiality is most likely to be found in longitudinal research. Longitudinal case research in marketing has often been advocated but has not been used a lot due to time and resource constraints (Biemans 2003). Cross-sectional case research, however, can also be used if the researcher can determine the sequence in which events occurred.

2. *Associative variation* occurs if changes in one construct are systematically linked to changes in another construct. Whereas statistical procedures usually rely heavily on associative variation when testing for a causal relationship, case research is generally weak in identifying associative variation because the number of cases is low. Although the old adage "correlation does not imply causation" (Hunt 1991, p. 87) holds, *absence* of associative variation is evidence that there is no causal relationship. Therefore, the theory-testing stage should be designed to determine associative variation, i.e. the level of each construct should be determined and the patterns of association compared to theory. Also, a multiple case study design is preferred, making it possible to compare the results of a case study to the results of other case studies.

3. *Nonspurious association* means that there is no omitted factor that can account for the association between two constructs. The risk of overlooking an important construct is low in case research, as long as the researcher keeps open ears, eyes, and mind. In fact, the context richness of most case research minimizes the chance of important factors being omitted. It is in determining nonspurious association that logical argumentation can be of assistance. By extracting logical arguments from the empirical data, additional evidence for the nonspuriousness of an association is gained.

4. *Theoretical support* is needed to give plausibility to a claim of causal relationship. If a causal relationship is found to be in accordance with a theory that has proven to be successful in explaining related phenomena, it makes the existence of a causal relationship all the more likely (Hunt 1991). This is not to imply that every finding needs to fit with theoretically accepted relationships. "Nevertheless, the burden of proof must lie with the proposer of new 'nonfitting truths'" (Hunt 1991, p. 88). Chapter 3 of this dissertation provides the theoretical background that can serve as support for causal relationships to be found in the theory-testing stage.

Summarizing, the theory-testing stage uses a multiple case study design, with preferably longitudinal cases. The case study protocol should capture the temporal sequence, allow for associative association to be determined, and stimulate informants to provide logical arguments for causal relationships.

4.2 Case Selection

For the theory-testing stage, four product development projects are selected. By carefully selecting slightly structurally dissimilar situations, generalizability of the findings increases. This can be compared to an experimental researcher that performs a similar experiment under four slightly dissimilar sets of conditions, as replications of each other. As in the theory-building cases, two sets of selection criteria are used; one set of unifying criteria and one set of differentiating criteria. The set of unifying criteria contains the same set of criteria used in the theory-building cases: a case has to involve a physical product, the focal organization has to be within the geographical reach, the project has to have been completed and the product introduced, and finally, enough informants have to be accessible. As an extra selection criteria all cases have to involve green products, i.e. products whose environmental performance is significantly better than conventional or competitive product offerings (Peattie 1995, see Chapter 1).

The set of differentiating criteria is different for the theory-testing cases. The theoretical model, developed in Chapter 3, is used to guide the case selection. The theoretical model identified a set of antecedents and a moderating construct, that both determine various aspects of GPI strategy. The antecedents are top management commitment, scope, and scrutiny of stakeholder orientation, and the moderating construct is industry type. Ideally, all antecedents and the moderating construct should serve as selection criterions. Using all antecedents and moderator, however, is not feasible, for two reasons. First, scope and scrutiny are not readily observable, and extensive field work should be undertaken to determine the constructs. Therefore, scope

and scrutiny of stakeholder orientation are determined *a posteriori*. Second, if all antecedents and the moderator construct were to have two levels in the design, e.g. 'high' and 'low', a full-factorial design implies 2 x 2 x 2 x 2 = 16 case studies to be undertaken. Such a number of cases far exceeds the time and resource constraints of this study. Therefore, industry characteristics and top management commitment to green issues are used as selection criterions. For both constructs it is a priori possible to assess the level with sufficient reliability, as will be outlined below.

Based on the sets of unifying and differentiating criterions, four product innovations are selected, as depicted in Table 2.1. One case involves a longitudinal case study, as the opportunity arose to conduct such a study that fit well in the case study design. During the data collection of the theory-building case studies in 1998, data were also collected on an embryonic product innovation within ChemCorp CR. This was done primarily upon request of the business unit. The collected data about the product innovation project were not used in the theory-building stage in Chapter 2, because the case did not meet the criterions for inclusion as the product had not yet been introduced to the market. As the opportunity arose to collect additional data after the product innovation had been introduced to the market, including the case offered several advantages. The first advantage is that the information needed for the selection criteria can be more reliably assessed from the previously collected data. The second advantage is that the risk of hindsight bias is reduced, because informants were interviewed both during the product development stage of the project, as well as after the introduction. The third advantage relates to the condition of temporal sequentiality for establishing causal relationships, as outlined in the previous section. Temporal sequentiality can be assessed without bias by observing the events in temporal sequence. Further rationale and procedure for the selection of the four cases is discussed in the remainder of this section.

Table 4.1: Case Studies for the Theory-testing Stage

Industry	**Green Commitment of Top Management**	
	Moderate	**High**
Food (moderate environmental impact)	Prins & Dingemanse[a] *Mussel Bag*	Gulpener *Limburgs Land*
Chemical (high environmental impact)	ChemCorp CR *Hardcoat*	Ecover *SquirtEco*

[a] Focal organizations are printed first, followed by case study product in *italics*.

Selection on Industry Characteristics

For the theory-building cases, two industries were selected on a general notion that environmental issues played a different role in each of the two industries. One of the results of the theory-building cases was that market environment was likely to have a moderating impact on relationships in the theoretical model. More specifically, two aspects of market environment, being the existence or emergence of green demand in a market and the existence or emergence of green regulation, emerged as potentially

important. Therefore, selection of industries in the theory-testing stage is done with more scrutiny, based on the former two aspects of market environment.

Both the food and the chemical industry are suitable industries in this stage of the research. At the time of data collection, 2004, green demand in both the food market and chemical market is present. In the Dutch food market, a niche for organic products is well-established with a market value of € 395 million, representing 1.6 per cent of total food market sales in 2003 (Biologica 2004). In the Dutch chemical industry, the size of green market demand is more difficult to assess *a priori*. During the data collection for the theory-building case studies in the car refinish market in 1998, stringent regulation was announced for that particular market that would create demand for green products. In consumer markets for chemical products, inventories of green products in the Netherlands show that several companies are marketing green products in product categories as paint, detergents, and household cleaners (NIDO 2002; Stichting Milieukeur 2004). The latter suggests that there is some degree of green market demand in consumer markets in the chemical industry.

Table 4.2: PACE of Manufacturing Industries in the Netherlands 2001

SIC[a]	Industry[b]	PACE (K€)	Average PACE per firm (K€)	PACE as % of Added Value
DA	Food, beverages, and tobacco	291,000	198	2.22
DB/DC	Textile and leather	N/A	N/A	2.99
DE	Paper production, printing, & publishing	102,000	74	3.61
23	Petrol and coal processing	237,000[c]	11,850[c]	3.81
24	Chemical products	570,000	1,425	6.84
26	Glass, ceramics, and cement	70,000	157	N/A
DJ	Basic metal and metal products	189,000	90	
	- Basic metal			8.14
	- Other metal			1.13
29	Machinery and equipment	45,000	29	N/A
DL	Electrical and optical products	51,000[c]	72[c]	N/A
	Miscellaneous	N/A	N/A	1.07
D	Total manufacturing	1,703,000[d]	157	2.42

[a] SIC = Standard Industry Code 1993 of CBS/Statistics Netherlands
[b] All figures apply to firms with 10 or more employees.
[c] Year 2000 data
[d] Column figures do not add up to total because CBS/Statistics Netherlands does not report data for all manufacturing sectors for reasons of data protection.
Sources: CBS/Statistics Netherlands Statline Database and RIVM-MNP (2003b)

The main difference between both industries is in stringency of regulation. This is well reflected by data on the Pollution Abatement and Control Expenditures (PACE). PACE is an indicator used by national statistics offices such as the US Bureau of the Census. For the Netherlands, it is compiled by CBS/Statistics Netherlands (CBS 2003; RIVM-MNP 2003b). The Dutch PACE indicator is defined as the costs of the own environmental activities plus the environmental levies paid, corrected for the environmental subsidies received. PACE is often used as a measure for the stringency of regulation in an industry (Lanjouw and Mody 1996; Jaffe and Palmer 1997; Pickman 1998; Brunnermeier and Cohen 2003; Nameroff et al. 2004). If regulations become more stringent, companies are required to take measures and make investments,

which are reflected in PACE. Table 4.2 shows that the average PACE per firm are more than seven times higher in the chemical industry than in the food industry, and that PACE as a percentage of added value in the chemical industry are more than three times higher than in the food industry (both industries are shown underlined in Table 4.2).

Based on green market demand and stringency of regulation, the food industry is classified as a moderate environmental impact industry, and the chemical industry is classified as a high environmental impact industry. This classification corresponds with the results of other research. Banerjee et al. (2003) used two independent judges that classified the food industry as a moderate environmental impact industry, and the chemical industry as a high environmental impact industry. They subsequently show that moderate environmental impact industries differ significantly from high environmental impact industries in environmental public concern, regulatory pressure, and opportunity to gain competitive advantage through environmental issues.

Selection on Top Management Commitment to Green Issues

Selection of focal organizations was done based on top management commitment to green issues. Although this construct cannot be reliably observed *a priori*, there are several reliable indicators of commitment of a firm to green issues. Indicators of high commitment are special recognitions of a firm's commitment to green issues, or more broadly, corporate social responsibility issues, by the general press, awards, certifications, or academic sources. Low or moderate commitment is more difficult to observe, because organizations will generally not communicate this as such and this aspect will generally not receive special attention in the general press or otherwise, save incidental situations.

Ecover and Gulpener are selected as focal organizations with high top management commitment to green issues. Ecover is widely quoted as an example of a firm with a 'green' mission in the general press, academic textbooks, and academic teaching cases (e.g., Pauli et al. 1995; Reichart et al. 1999). Furthermore, the company was awarded a place on the 'Global 500 Roll of Honor' of the United Nations Environment Program in 1993. Gulpener received the national corporate social responsibility award from the Dutch Ministry of Agriculture, Nature, and Food Quality in 2003 and was nominated for the Sustainability prize of the Province of Limburg.

Two companies are selected with moderate top management commitment to green issues, rather than low commitment, because the chances of finding GPIs in focal organizations with low commitment seems minimal. ChemCorp CR and Prins & Dingemanse are selected as focal organizations with moderate top management commitment to green issues. ChemCorp CR is classified as 'moderate', based on data collected for the theory-building stage. A benchmarking study on corporate social responsibility confirmed the assessment: the corporation was reported to be in the middle tier within the Dutch chemical industry (Graafland et al. 2003). Assessment of top management commitment to green issues was more uncertain for Prins & Dingemanse. Initial desk research revealed no indications of high commitment, but no indications of the opposite either. Therefore, top management commitment to green is-

sues was assessed during the first two interviews, showing that it can be classified as 'moderate'.

Identifying Green Products

The theory-testing stage involves green products, i.e., product innovations are selected whose environmental performance is significantly better than conventional or competitive product offerings. As was learned during the theory-building stage, this is very difficult to observe *a priori*. Selection therefore relies primarily on the judgment of a third party, being a certification authority, government body, or expert(s).

Evidence of improved environmental performance of Mussel Bag is provided by a special recognition of a Dutch government body, Novem, the Netherlands Agency for Energy and the Environment, on a web site dedicated to energy efficient product development. The product innovation is included as a showcase project (Novem 2004). It was estimated that the product is responsible for a 50.4 TeraJoule energy saving through material reduction and a 57 per cent saving in transport mileage. Limburgs Land is selected because it is listed by Stichting Milieukeur, the Dutch ecolabeling authority for its use of ecolabeled barley as a raw material (Stichting Milieukeur 2004).

Hardcoat is the only product innovation for which a lifecycle analysis is available, acquired during the data collection for the theory-building cases. The lifecycle analysis was performed by two environmental experts and showed that the product offered considerable green improvement compared to conventional products. SquirtEco is selected because it was awarded an ecolabel by the Vegan Society and based on a taped interview with a senior manager of the focal organization, from an earlier research project by two graduate students[2].

4.3 Data Collection

This section describes the data collection procedure. First, the nature of the data sources is described. Second, the selection of informants for the interviews is described. Finally, the case protocol is explained, with particular attention for the interview procedure used to elicit information about causal relationships.

Data Sources

Data for the theory-testing cases were collected through in-depth interviews with key informants and documents (Table 4.3). Data collection took place in 2004. Key informants were selected on information provided in the first interview with the initial contact person who were asked to identify all company employees who worked on the project. Two informants had left their respective firms but agreed to an interview nevertheless. One manager that was identified as a key informant was not available

[2] The author gratefully acknowledges Linda van Haren and Kevin Mori for making the audio tape available.

for interviewing. Generally, informants were first notified by the initial contact person about the study, and contacted by the researcher later.

Earlier interview reports were entered into the case study for Hardcoat. Only interview reports of the theory-building stage that addressed the product innovation were used. The data referring to Hardcoat have been left out of the analysis in Chapter 2, and are used here to create a longitudinal case study.

Table 4.3: Data Sources in the Theory-testing Stage

Cases	Hardcoat	SquirtEco	Mussel Bag	Limburgs Land	Total
Interviews	4 (6.25 hours)	5 (7.5 hours)	4 (5.5 hours)	5 (6.5 hours)	18 (25.75 hours)
Informants	4	6	4	4	18
Earlier interview reports	9[a]	-	-	-	9
Documents and artifacts	21	15	14	9	58

[a] Selected interview reports from fieldwork for the theory-building stage, with information about Hardcoat, to allow for longitudinal case study.

All interviews were tape-recorded and fully transcribed. This resulted in a case database of the written interviews with approximately 200,000 words. To keep inventory of the information acquired from the interviews, two-page contact summary forms (Miles and Huberman 1994) were composed within hours of data collection for most interviews. Acquired documents or artifacts were catalogued in an EndNote reference library under keywords, based on the construct categories in the theoretical model.

Documents of the theory-testing case studies were internal documents (such as marketing manuals, written guidelines, and strategic plans), external documents (such as press reports and web sites). The documents were mainly used for triangulation purposes, i.e. to verify information provided by informants. In several instances, however, informants would talk about a topic and refer to the relevant document for more detail. In those cases, documents are used as an additional data source. Some documents were very information-rich, such as a detailed introduction manual, describing in detail how a product was introduced. Artifacts include products or packaging of the product innovations and advertising materials.

Informants

Table 4.4 shows the principal domains in which the informants were active. In identifying key informants, special care was taken to ensure that a business function that had significant involvement in the development project was represented by an informant, to avoid any functional biases in the data collection and to be able to triangulate findings across informants with different perspectives. The table shows that informants from various domains were interviewed. In the food industry, no informants were interviewed whose primary domain was ‘environmental management’. The reason for this is that the two firms under investigation in the food industry did not have

a manager whose primary task was environmental management. In both firms, the environmental management function was part of manufacturing or quality management. In one case, the person responsible for environmental management was interviewed because he was involved as an R&D participant in the development project, which is classified under the R&D domain in Table 4.4. In the other case, the person responsible for environmental management was not involved in the development project.

Table 4.4: Informants for the Theory-Testing Cases

Domain	Chemical	Food	Total
General Management	1	2	3
Marketing	5	3	8
R&D	2	3	5
Environmental Management	2	0	2
Total	10[a]	8	18

[a] Informants from fieldwork for the theory-building cases are not included in this table, although data from nine interviews from the theory-building stage were used to perform a longitudinal case study of Hardcoat.

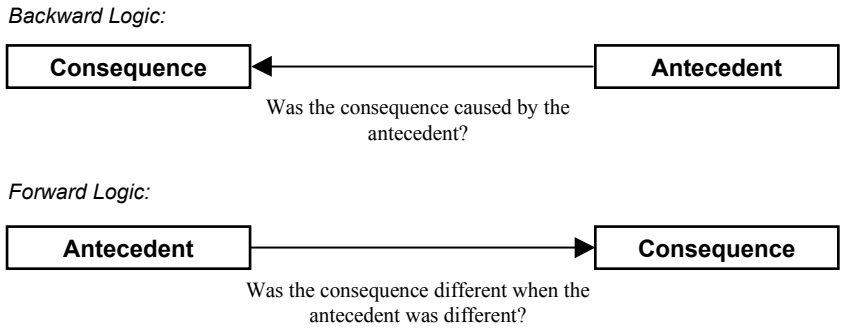
Case Protocol

Before data collection started, an elaborate case protocol was developed (Yin 1994). The protocol contained the full data collection and analysis procedure, interview guides, blank information displays, and the coding scheme. Two structurally different interview guides were used: one for the initial interviews, focusing on obtaining a general understanding of the firm and agreement on case study details, and the main interview guide, to obtain the data for theory-testing . The main interview guide took the shape of a training guide and a field guide. The training guide was a document of four pages, stating several probe questions for each topic. The interviewer would typically review the training guide before an interview. The field guide was an abridged version, allowing the interviewer to have an overview in a quick glance (see Appendix 1). A separate training and field interview guide were used to improve the quality of data collection by advance training and is advocated by Yin (1994). The order of the interview guide was changed to reflect the area of expertise of the informant. For instance, an interview with an R&D informant would typically start with questions about the development process, whereas an interview with a marketing informant would typically start with introduction strategy. By rotating the topics in the interview guide, rich data were collected on all of the topics under research, because informants have the tendency to give the most elaborate responses about issues that are brought up early in the interviews. The language of the interview guides, as well as the interviews themselves, was Dutch, as this is the mother tongue of all informants and the interviewer. Headings in the interview guide were innovation process characteristics, innovation product characteristics, introduction characteristics, innovation performance, and industry/market context. The antecedents in the model, top management commitment to green issues, scope and scrutiny in stakeholder orienta-

tion, were discussed under the headings of the constructs to which they are proposed to be antecedents.

To elicit information about causal relationships between constructs, two different probes were applied (Figure 4.1). First, an informant would be invited to use *backward logic* to elaborate on the causal relationship. The informant was asked to give an explanation for an element of GPI strategy, first in an open format, then in a closed format in which the interviewer would provide possible explanations in terms of proposed antecedents. Second, an informant would be probed to use a *forward logic*, by inviting the informant to provide examples or philosophize what would change in an element of GPI strategy if a proposed influencing factor were to be different. The proposed influencing factor could be different in another market, in time, a different product innovation of the firm or of a competitor. To aid the informant in this task, the interviewer would suggest a ground for comparison based on information earlier in the interview or in earlier interviews in the same case study. Table 4.5 provides an example of the interview procedure, applying both forward and backward logic. This interview procedure was used for all proposed causal relationships in the model.

Figure 4.1: Backward and Forward Logic in the Interview Procedure



4.4 Data Coding and Analysis

The cases for theory-testing were analyzed using a procedure of coding and memo development. For the theory-building cases, a more holistic and exploratory descriptive analysis was used, in order to achieve the flexibility that is required to develop theory. For the theory-testing cases, however, a more formal procedure is appropriate. First, in a descriptive analysis, the constructs in the theoretical model need to be assessed for each case. Then, in a causal analysis, the proposed relationships need to be assessed, and subsequently, logical argumentation extracted from the case data for relationships that are found to exist. Special attention is given to validity concerns for both the descriptive and the causal analyses. Also, reliability was established through audits by a judge. Both analyses are preceded by a procedure of coding and memo development, which will be described first.

Table 4.5: Interview Procedure Example, Including Forward & Backward Logic

Probe Category	Construct/Causal Relationship	Example Probes
Description	Innovation product characteristics	"How would you describe the main characteristics of the innovation, and what exactly are the advantage over earlier products?"
Backward logic, open ended	Any antecedent – Innovation product characteristics	"Could you please explain why the product ended up having these characteristics?"
Backward logic, closed	Stakeholder orientation scope – Innovation product characteristics	"About which actors did you have information that was relevant to the product?" (check stakeholders: buyers, competitors, regulators, suppliers, distributors, employees, SIGs, owner/shareholders)
Forward logic	Stakeholder orientation scope – Innovation product characteristics	"If you had paid less attention to (important stakeholder mentioned in interview), how would this have influenced the product?"

Coding and Memo Development

To analyze the data, a formal coding procedure was followed. First, all transcripts were re-read and the audio recordings of each interview were listened to, in order to make sure that the transcripts accurately captured the information on tape. Second, transcripts were divided into text segments, representing more or less coherent episodes in the interview. A segment contained 250 words on average, and the entire case database contained 836 segments. The transcripts were then entered in a qualitative data analysis software program, Kwalitan (Peters 2004)[3]. Kwalitan has the advantage of being able to handle codes that are embedded in a hierarchical structure (Miles and Huberman 1994, p. 63). Also, the nine selected interview reports of the earlier data collection for the longitudinal case study of Hardcoat were entered into Kwalitan.

The segments were coded manually in Kwalitan, following a hierarchical coding scheme. The coding scheme was developed from the theoretical model, with two types of codes: 'descriptive and within-construct causal' codes, that represent the major constructs in the theoretical model, and 'causal' codes, that represent the causal relationships between the major constructs. The full hierarchical coding scheme is in Appendix 2. The coding scheme is a combination of descriptive, interpretive, and pattern coding (Miles and Huberman 1994). The main categories are-predefined codes based on the constructs in the theoretical model and their relations. Some of the lowest subcategories emerged from the case data, and were added during the coding itself.

[3] The author gratefully acknowledges dr. Vincent Peters of the Nijmegen School of Management for providing the software and making various changes to the software upon the author's request.

Codes were applied to either whole text segments or a short fragment of a text segment. A segment or fragment can receive multiple codes. The following is an example of a text fragment translated from Dutch, taken from one of the interview transcripts:

> "*(Informant:)* If the feasibility document had followed the route then, as is the case nowadays, the issue would have been noticed. We would have had a different trigger spray. *(Interviewer:)* So would you say that a different solution would have been chosen? *(Informant:)* Then it would have been included in the requirements, and the management would have considered it and they would have, I think… If you see what is happening nowadays with the feasibility document…; it is adhered to rather precisely. I am almost sure that the trigger spray we have now would not have been the result of the process and that we would have had a more ecological version of the bottle."

This fragment received two codes: 'coordination – greenness', indicating that a causal relationship between coordination and greenness is elaborated upon, and 'relationship positive' indicated that the informant indicates that more coordination leads to higher greenness and explains how.

Table 4.6 shows the frequencies for each of the top level coding categories, being the 'main branches' of the hierarchical coding tree. Thus, each category represents several codes. The numbers in the table indicate how many segments contain information about a coding category. This table thus shows the richness of information of the case database on each of the topics. It does *not* convey information about the contents of each coding category. E.g., if a segment contains information about an aspect of stakeholder orientation, the information can be that aspect of stakeholder orientation was either present or not present in the case. The table shows that the case database is very rich on describing the stakeholder orientation, as well as the product and process characteristics. On average, the causal codes have lower frequencies than the descriptive codes. The latter is due to the fact that informants would rarely elaborate spontaneously on the causal relationships, but had to be probed extensively in order to attain information about whether, how, and why one construct would be an antecedent to another. Table 4.6 shows that the fieldwork yielded a rich case database, suited for the theory-testing purposes of the study.

Parallel to the coding, memos were developed (Miles and Huberman 1994; Drumwright 1996). For each of the four cases, a several-page set of memos was written. The total set of memos spans forty-five pages. Most of the memos are tied to a specific code, giving a brief explanation of the meaning of the code within its context, often with a reference to a particular text segment that illustrates the code particularly well. In this way, memos are a way of condensing the data without the inevitable loss of interpretative richness by just assigning codes to the transcripts. Other memos are of a methodological nature (e.g., setting norms for coding), or summarize essential aspects of a case (e.g., putting events in chronological order where informants gave an unstructured account of the events).

Table 4.6: Frequencies for Top Level Coding Categories

Coding Category	Number of Segments[a]
Descriptive	
Top management commitment to green issues	23
Stakeholder orientation	193
Process characteristics	144
Product characteristics	120
Introduction strategy	65
Innovation performance	60
Industry environment	32
Causal	
Top mgt. Commitment to green issues – Process characteristics	22
Stakeholder orientation – Process characteristics	28
Stakeholder orientation – Product characteristics	38
Stakeholder orientation – Introduction strategy	8
Process characteristics – Product characteristics	9
Product characteristics – Introduction strategy	31
Product characteristics – Innovation performance	36
Introduction strategy – Innovation performance	12

[a] 'Number of segments' indicates the number of segments that contain information about the codes in a certain coding category (refer to Appendix 2 for actual codes under each coding category).

Descriptive Analysis

After coding and memo development, the data were analyzed using content analysis. The first analysis was a descriptive analysis. The purpose of the descriptive analysis is to understand the constructs, in order to test whether the constructs are operationalizable and meaningful, as well as to obtain an assessment of the level of each construct. The main concern in the descriptive analysis is validity in measurement. Bagozzi (1994, p.18) defines validity in the context of measurement as "the degree to which a concept and its measures achieve theoretical and empirical meaning within the overall structure of one's theory". Three types of validity are distinguished (Kerlinger and Lee 2000, pp. 666-7): content validity, construct validity, and criterion-related validity. Each type of validity must be established in the analysis.

1. *Content validity.* Content validity refers to the theoretical and observational meaningfulness of the concepts in the study (Bagozzi 1994, p. 19). Theoretical meaningfulness has been established in Chapter 3, and some concepts have proven to be observationally meaningful in the theory-building stage (Chapter 2). Many concepts, however, are somewhat different from the concepts established in the theory-building stage, or were included in the theoretical model based on the re-

sults of the theory-building stage. Therefore, content validity is assessed in this stage of the research as well. Content validity is established by careful judgment whether fragments represents the substance matter that the construct is intended to measure (Kerlinger and Lee 2000). This is done both by establishing observational meaningfulness from the data during the descriptive analysis, as well as auditing of the coding by an independent judge (see under the heading 'Reliability' below for details).

2. *Construct validity.* Although construct validity is arguably the most important type of validity in research in the social sciences (Kerlinger and Lee 2000), it is also the most difficult to achieve in case study research (Yin 1994). In general, construct validity is established by demonstrating convergent validity and discriminant validity. Convergent validity in this study is achieved by triangulation in data sources and/or informants (Yin 1994). At the very least, two fragments from different sources or informants should point in the same direction to establish convergent validity. Discriminant validity is established by demonstrating low association between different constructs. The latter is assessed by drawing up multiple tables with assessments for each construct in each case in the descriptive analysis in Chapter 5. Specifically, Yin suggests three tactics to increase construct validity in case study research (Yin 1994, p. 34-35). The first is multiple source of evidence, following the same logic as established above under convergent validity. The second tactic is to establish a 'chain of evidence', by providing citations to the case study database in the text and explanations of interpretation, and clearly specifying the procedures and protocol followed (which is done in this Chapter). The third tactic to increase construct validity is to have the draft case study report reviewed by key informants. For each case, a key informant reviewed the draft of Chapter 5, and where applicable, changes were made.

3. *Criterion-related validity.* "Criterion-related validity addresses the degree of connectedness of a focal measure or scale with another measure or scale" (Bagozzi 1994, p.19). It is established in this study by demonstrating predictive or nomological validity. Predictive validity refers to the degree in which a construct is able to predict a criterion variable and/or the degree in which it is predicted by another concept. Nomological validity is a related notion, referring to the role the construct plays in a larger theoretical framework, rather than its relationship with a single concept. Again, this is not easy to establish in case study research, and it has received little attention in this context. If relationships are tested in a causal analysis, however, using the principle of theoretical generalization (Hillebrand et al. 2001), both predictive and nomological validity can be assessed. Testing for relationships is the purpose of the second stage of the analysis in this study, the causal analysis.

All three types of validity are assessed in the study. Some types of validity can only be assessed as part of the descriptive analysis, and criterion-related validity is best assessed through the causal analysis.

In order to establish observational meaningfulness, to check for discriminant validity, and to enable testing for relationships, the level of each construct is assessed for each

case. The unit of analysis was the selected product and the associated product development project. The descriptive analysis was performed by categorizing the text segments by the relevant code: e.g., when analyzing coordination of green issues, all text segments with 'coordination' codes were reviewed and interpreted. This was achieved by applying various filters to the case database in Kwalitan, so that all segments or fragments belonging to a code in a selected branch of the coding hierarchy were shown. Memos were used to support this analysis. Documents and artifacts were used as supporting case material in the analysis of the descriptive codes, for triangulation purposes. The assessments for each construct yield information display matrices. Each assessment is accompanied by a short explanatory text to contribute to the 'chain of evidence'.

Constructs are assessed on a scale ranging from 'very low' to 'very high'. Due to the variability in both contexts and in the richness of information, fixed correspondence rules for assessing constructs cannot be specified (cf. Bagozzi 1984). Therefore, this assessment depends heavily of the interpretation of the researcher, which is a potential error source. To reduce the size of this error, the assessments were made using the following guideline. Assessments were made primarily on comparison *between* cases. Many times, this proved difficult because contexts differ significantly between cases. In such instances, assessments were based on comparisons *within* cases, i.e. the case product is compared to other development projects involving other products. The comparisons serve to better assess the relative position of the product on a given construct. E.g., when assessing newness, a better insight is gained through comparison with other product innovations in the firm or the industry.

The 'scope' variable in the stakeholder orientation construct is an exception to the assessment described above. It was treated as a count variable. Whenever an informant mentioned that information about a certain stakeholder had or had not been generated, the segment involved received the code for the relevant stakeholder orientation as well as a code 'scope yes' or 'scope no', respectively. In the analysis, cross tabulations were made of the orientations against scope, in addition to a more interpretive review of all the text fragments.

Causal Analysis

The purpose of the second stage of the analysis, the causal analysis, is to test the relationships between constructs. Whereas in the descriptive analysis, the analysis was performed primarily per case, the causal analysis was performed across cases. Also, in analyzing causal relationships, the scope of the analysis was broadened to include the comparative remarks. In probing the informants to give information about causal relationships, informants were invited to compare the product to other products, marketed by the firm or competitors, or to compare to different times or markets. In doing so, informants were asked to elaborate on the logic behind the differences. The analysis took place in two steps: determine association, and extract logic from the case data.

1. *Determine association.* From the assessed levels for each construct, associative patterns become visible between constructs. A comprehensive cross-construct

analysis, in which the levels of all constructs are visible for each case, is helpful in determining associative variation. This was the starting point of the causal analysis. Associative variation, however, is only one of the four conditions that need to be met to establish a causal relationship (see Section 4.1).

2. *Extract logic from case data.* By extracting underlying logics for the relationships from the case data a second condition for establishing a causal relationship is met, i.e. nonspurious association. Because the case data allow for a reconstruction of the order in which events took place, a third condition, temporal sequentiality, is also met. The underlying logic for a relationship is extracted from the case data by examining the coded fragments. All segments/fragments containing information about a causal relationship was viewed simultaneously by applying filters to the case database in Kwalitan. For instance all codes referring to relationships falling under the general label 'stakeholder orientation – process' were printed. These fragments were then carefully reviewed and manually coded to discover recurring logics for relationship. The codes were 'emic', i.e. developed from the data while coding, rather than predefined categories. The manual recoding typically took several iterations. Parallel to the recoding, memos about causal relationships were reviewed, and often reinterpreted in light of the results of the manual recoding. In following this procedure, rival explanations were excluded and the problem of spurious association avoided, thereby enhancing the internal validity of the outcomes (Yin 1994, p. 35).

A fourth condition for establishing causal relationships, theoretical support, was already met. Therefore, by following the procedure described above, inferences can be made about the proposed causal relationships. Testing is achieved by a procedure similar to statistical testing. The null-hypothesis of no relationship is rejected if the observed association corresponds with the proposition *and* the association can be explained by a logic extracted from the case data. In case an anomalous association is observed, this does not lead to the null-hypothesis not being rejected if solid logic can be found why the case is an anomaly. If insufficient data were available about a causal relationship, the null-hypothesis of no relationship was not rejected.

Reliability

An expert on qualitative analysis (a faculty colleague) served as an external judge. The procedure is similar to that followed by Drumwright (1996) and Bansal and Roth (2000). Because there were many hundreds of pages of interview transcripts and documents, the judge reviewed the data from one case. The evaluation by the judge took the shape of three audits, in various stages of the analysis (Miles and Huberman 1994). In the first audit, the judge was asked to review the data and initial coding of one interview. Based on this first audit, revisions were made to the coding scheme, and memos developed that described when to assign and when not to assign a specific code. The rest of the data was then coded by the researcher, upon which the second audit took place. In the second audit, the judge reviewed all 425 codes that were assigned to the remaining data of the selected case. The researcher and judge agreed on 373 (87.8 %) of the codes. The 52 conflicts about coding were then resolved by discussion. Through discussion, the initial coding by the researcher was changed in 34

instances and left intact in 18 instances. Therefore, after consultation, the researcher and judge were in agreement about the initial coding in 391 out of 425 instances, bringing final coding agreement at 92.0 %. Finally, in the third audit, the judge was asked to read the draft case analysis and note disagreements regarding the conclusions that are drawn and quotations that did not fairly represent the case data. The judge had full access to the coded case database in Kwalitan, including memos, and was able to review all analyses. On the few instances the judge disagreed, the source of disagreement was removed from the manuscript.

Chapter 5: Results of the Theory-Testing Case Studies

In this chapter, the results of the theory-testing cases are discussed. As outlined in Chapter 4, the analysis reported in this chapter serves two purposes. Firstly, in a descriptive analysis, to understand the constructs, in order to test whether the constructs are operationalizable and meaningful, as well as to obtain an assessment of the level of each construct. Secondly, in a causal analysis, to test the relationships between constructs. This chapter will first introduce the four cases. Then, the results of the descriptive analysis are discussed (Sections 5.2 through 5.7), followed by the results of the causal analysis (Sections 5.8 through 5.10). Finally, in the discussion section, the results for each of the propositions from Chapter 3 will be summarized and conclusions drawn.

5.1 Case Summaries

This section provides a brief description and summary for each of the four cases. Special emphasis is put on the unique characteristics of each case, such as history and technology, to paint the general context. Table 5.1 lists the main descriptive features of the cases.

Table 5.1: Descriptives of Cases in the Theory-Testing Stage

Industry	Firm	Case	Product Description	Major Green Improvement(s)
Chemical	Ecover	SquirtEco	Ready-to-use all-purpose cleaner	Highly biodegradable ingredients with low aquatic toxicity
Chemical	ChemCorp	Hardcoat	Car refinishing clearcoat	Ultra low VOC
Food	Gulpener	Limburgs Land	Lager type beer of regional origin	Organically grown ingredients
Food	Prins & Dingemanse	Mussel bag	Fresh mussels in non-leaking packaging	Less packaging, transport efficiency

SquirtEco

SquirtEco is a ready-to-use all-purpose cleaner in a spray bottle, introduced by Ecover in 2003. Ecover is a Belgian firm, founded in 1979, that pioneered the market of ecological detergents. It is now the worldwide market leader in ecological washing and cleansing agents, with a turnover of € 28 million in 2003 and employing approximately 70 people in Belgium and 25 abroad. Ecover sells its products in 22 countries. The firm is entirely devoted to the development and marketing of 'greener versions' of washing and cleansing agents marketed by mainstream multinational manufacturers. SquirtEco was developed as a response to many ready-to-use all-purpose cleaners being introduced by large competitors. Whereas with traditional all-purpose cleaners consumers had to mix the cleansing agent and water before use,

SquirtEco and other ready-to-use cleaners are already diluted and can be sprayed directly on a surface. The functionality of SquirtEco is comparable to mainstream, non-green, products in the same product category. Like all products developed by Ecover, SquirtEco was developed to minimize ecological impact by raising biodegradability, low aquatic toxicity, and high skin-tolerance. Furthermore, Ecover aspires to use raw materials from renewable resources, rather than raw materials of petrochemical origin, which are used by most detergent manufacturers. In SquirtEco, Ecover applied a new technology, biosurfactants, for the first time. These are tensio-active substances, lowering the surface tension of water and making it easier for dirt to dissolve in water, similar to traditional surfactants. Biosurfactants are produced by bacteria in a fermentation process, rather than by a synthesis process as is the case with traditional surfactants. Biosurfactants have much lower aquatic toxicity than traditional surfactants and are almost fully biodegradable. Ecover started fundamental research in the application of biosurfactants in cleaning agents in 2002, with Flemish and European Union subsidies, and in cooperation with European universities. When SquirtEco was developed, this became Ecover's first product to apply the new technology. Biosurfactants only account for a small proportion of the detergents applied in SquirtEco, because the experimental nature of the technology causes the manufacturing of biosurfactants to be exorbitantly pricey.

The product is sold in two versions: a bottle with spray and a refill bottle without spray. SquirtEco was introduced to several geographic markets and targets both light and dark green segments. The product is highly priced, because the product costs are high. Higher product costs are caused by the choice for an expensive spray trigger and the high costs of biosurfactants. In terms of innovation performance, informants consider it to be a 'healthy' product, meaning that it conforms to the performance targets of the firm. Given that it is the first product to apply biosurfactants, it is a precursor to a range of new products in which the technology can be applied as well.

Hardcoat

Hardcoat is a car refinishing coating introduced by ChemCorp CR[4] in 2000. It is a clearcoat, meaning that it is the transparent top layer of a two-stage or multi-stage coating, which is used to create special effects in car paint such as 'metallic' or 'pearl'. It is to be used in conjunction with a basecoat, the first layer of coating, which contains the pigments (color). It is the result of a very ambitious product profile that was made up by the top management of ChemCorp CR. The top management wanted a coating that had a ultra low VOC level (at most 250 grams/liter), that had no toxic effects, and that was at the same time more efficient in use than the current clearcoats. The technology that was used was serendipitously discovered in fundamental research into waterborne technology. The main characteristic of the new product is the speed of use: the drying time for Hardcoat is up to three times shorter than conventional products and the coating can be applied with fewer spray layers. Furthermore, Hard-

[4] Company and product names are fictitious for reasons of confidentiality. For background information on the company, its products, as well as the green issues attached to car refinishes, please refer to Chapter 2.

coat would be compliant to existing and future regulation, because of its exceptionally low VOC level. The product was introduced in Western Europe, and was most successful in the United Kingdom. As a whole, however, sales were very low and the product is considered a failure. This is due to a combination of factors, but the most important being the fact that the Hardcoat clearcoat was developed to be compatible with the solvent borne basecoat that was in use in 1998, but proved to be incompatible with waterborne basecoats and a newly developed solvent borne basecoat. This incompatibility was identified as a problem relatively late in the process. By the time Hardcoat was introduced, the Western European market was moving towards waterborne basecoats. Most Western European countries had either introduced regulation limiting the VOC level of car refinishes, or had suspended the introduction of new regulation on this issue awaiting stringent EU-wide regulation. As a consequence, car repair shops expected waterborne car refinishes to be the 'technology of the future', and the more innovative and environmentally conscious car repair shops were preparing to make the complete transition from solvent borne to waterborne basecoats. Although the combination of Hardcoat with a compatible solvent borne basecoat was compliant to some regulation (e.g., UK), the same combination was not compliant to regulation in the Netherlands. Future EU regulation will follow the Dutch, rather than the UK, regulation. An additional problem was that the product's relative speed was only of importance for a small group of car repair shops, and using the product required a high degree of professionalism for the car repair shop. Sales of the product in Western Europe never really took off. In the North-American market however, ChemCorp CR introduced a modified product, Hardcoat Solid, with higher VOC level and compatible with the new solvent borne basecoat, in 2004. The latter is considered to be a different product from the case product, but a suitable base for comparison.

Limburgs Land

Limburgs Land, a lager type organic beer, was introduced in 2004 by Gulpener. Gulpener is a small brewery, dating back to 1825, with a turnover of € 15 million in 2002, employing approximately 70 people. It is based in the Dutch province of Limburg, and markets its products mainly in the Netherlands. Prior to 1999, Gulpener's strategy focused on producing 'special beers', i.e. non-lager type beers such as *witbier*, monk beer, and dark beer, parallel to its main product, the 'Gulpener' brand lager beer. In this way, the firm was able to differentiate itself from large domestic and multinational companies. As the large beer companies discovered the growing segments for 'special beers' in the Netherlands, Gulpener's strategy started to lose its effectiveness. By 1999, the firm sought a new way to differentiate itself and changed its strategy to revolve around corporate social responsibility. The top management realized that some aspects of corporate social responsibility were already being practiced. Gulpener already had strong regional ties, a strong commitment to the local community, and a social agenda towards its employees. It adopted an integral chain management approach, and forged close relationships with its suppliers. Gulpener now buys only from regional suppliers that produce ingredients (e.g., barley and hops) that comply with the Dutch agricultural ecolabel or better. In its manufacturing processes, Gulpener conserves energy by not pasteurizing its beers and uses only energy from renewable sources, solar energy and hydropower from a nearby water mill.

The 2004 launch of Limburgs Land was in fact a relaunch of a brand that had been on the market since 1998. Originally, Limburgs Land was a beer produced from ingredients of regional origin, the province of Limburg. It was part of a larger project, initiated by Gulpener, to set up a range of food products of regional origin, together with other Limburgian manufacturers. The ingredients for these products were produced in a way that reduced environmental impact, but this was not certified in any way. The range of products, including Limburgs Land beer, was not particularly successful. After Gulpener's change toward a corporate social responsibility strategy, all Gulpener products were produced from ecologically grown ingredients of regional origin. Therefore, it made sense to Gulpener to take the Limburgs Land beer one step further. Both the company's former CEO and majority shareholder as well as the CEO wanted to have a beer from organically grown ingredients, as part of the corporate social responsibility strategy. When a local barley farmer announced that he was able to produce organically grown, certified, barley, Gulpener set out to develop the new version of Limburgs Land as an organic beer of regional origin. Organic hops were not available from the region, and to be imported from abroad. The product is certified by the government-recognized inspection body SKAL as an organic product, allowing it to carry the EKO trademark. The EKO trademark is a Dutch ecolabel for organically grown produce and food products produced from only organic raw materials. A study into the organic beer market revealed that most products marketed in the Netherlands were sold in health trade stores, had inferior taste, and high margins. The new Limburgs Land beer is targeted toward a green segment, sold in health trade stores and a small number of supermarkets. Being a very low-volume product, Limburgs Land was introduced with virtually no marketing budget. Because of limited availability of regional organic ingredients, production of the product in 2004 was limited to a mere 1,000 hectoliters (Gulpener's total production is approximately 120,000 hectoliters). Product acceptance by the health trade channel is very high, consumer feedback positive, and sales are more than forecasted.

Mussel Bag

Prins & Dingemanse is the market leader in the Benelux for fresh mussels. The firm was established in the late 19th century and is the largest subsidiary of the Prins Groep, a group of subsidiary firms that market fresh mussels, mussel conserves, and other shellfish like oysters and cockles. Total revenues of the Prins Groep were € 40 million in 2002. The firm is based in Yerseke in the Dutch province of Zeeland and employs approximately 150 people.

Fresh Zeeland mussels are a much sought-after delicacy, particularly in Belgium, The Netherlands, and France. These countries are the three principal markets for Prins & Dingemanse fresh mussels, in which they are marketed to both wholesalers, who have restaurants and fish specialty stores as their clients, as well as mass retailers such as supermarkets. In 1997, Prins & Dingemanse introduced a new, non-leaking type of packaging for fresh mussels. This was the result of a lengthy innovation process. The firm had been searching for a satisfactory non-leaking packaging since 1980 and tried out many different concepts. Only one of these concepts was introduced, a plastic bucket with a leaking tray but was not successful in the market. Competitors had also introduced non-leaking packaging for fresh mussels but none of these products had

ever managed to be more than a niche product. Packaging fresh mussels in a non-leaking packaging without loss of quality was a complex problem that could not be solved for years, even with the help of international specialists. The complexity was caused by the fact that fresh mussels are a living product, and in order to guarantee quality and freshness, the mussels are preferably alive when the consumer prepares them. In closed, i.e. non-leaking, packages mussels die rapidly from exposure to their own leaking liquids and/or lack of fresh oxygen. Therefore, mussels were traditionally sold in bags with holes, to allow the leaking liquids to leave the bag and oxygen to enter the bag. Leaking mussel bags posed a problem however for distributors and retailers, because the leaking liquids would smudge and even damage truck holds, refrigerators, cash registry scanning devices, conveyor belts, etc. Also, the slippery leaking liquids on floors were a safety hazard to employees and customers. Retail organizations sometimes refused to allocate shelve space to fresh mussels because of the problems involved with leaking liquids.

A solution was eventually found in conditioned packaging, in which the mussels were preserved in an atmosphere of oxygen and carbon dioxide in a certain ratio that puts the mussels 'in sedation'. This was achieved in cooperation with an industrial gas manufacturer, and Syntens, a government-linked agency that stimulates innovation in SMEs. A laminated plastic bag was chosen, rather than a tray or bucket, to minimize the amount of packaging. The conditioning technology was patented in many countries and the firm sells licenses to apply the technology worldwide. The green improvement of the non-leaking mussel bag was that it meant a reduction in packaging material to all other forms of non-leaking packaging and it facilitated transport of the product, thereby dramatically reducing the transport mileage. The mussel bag was originally introduced in one size, 1 kilogram, which turned out not to be popular with retailers, upon which the product line was extended to include bags of 2 kilograms and more. The 1-kilogram non-leaking bag was introduced with only two retailers in 1997, and full-scale introduction followed in 1998. In that year, sales exceeded all expectations. One and a half year after introduction, the new packaging accounted for more than 80 per cent of all sales of fresh mussels by the firm. Domestically, and increasingly internationally, the conditioning technology became the dominant design in the industry.

5.2 Antecedents

In the theoretical model, two different types of antecedents are identified: top management commitment to green issues and stakeholder orientation. The first antecedent was controlled for in the case selection. In line with the first objective of the theory-testing stage, however, top management commitment to green issues is assessed from the case data. A careful understanding of the exact manner in which the top management commitment to green issues is manifested is essential for understanding the relationship with GPI strategy. The analysis of the second antecedent, stakeholder orientation, reveals four important points: (1) about the distinction between generic and project-specific stakeholder orientation, (2) about systems, tools, and practices in stakeholder orientation, (3) about scope in stakeholder orientation, and (4) about scrutiny in stakeholder orientation. The findings about top management commitment to

green issues, as well as findings about stakeholder orientation, are summarized in Table 5.2.

Table 5.2: Antecedents of GPI Strategy

Case	Top Mgt. Commitment to Green Issues (selection variable)	Project-Specific Stakeholder Orientation	
		Scope[a]	Scrutiny[b]
SquirtEco	High, is 'raison d'être' of the firm, pervading the organization	Competitors Customers Other (research centers) Supply chain members SIGs	Low: store-checks Low: ad hoc focus group, complaints High: patent screening, cooperation Mix: dialogue w/ health trade, low otherw. High: dialogues, expert source
Hardcoat	Moderate, 'good citizenship', increasingly aimed at reducing liability risks in health issues	Customers Regulators Competitors	Low: little research, no latent needs Low: did not see stringency of legislation Low: unstructured, ad hoc
Limburgs Land	High, strategic choice for CSR strategy, diffused through organization	Competitors Supply chain members Customers	Low: desk research, store checks Mix: relationships w/ suppliers, retail: low Low: 'armchair logic', very little research
Mussel bag	Moderate, 'good citizenship' for survival of the industry	Supply chain members Competitors Customers Other (other firms)	Low: some dialogue, no latent needs High: reverse engineering Low: very little research, no latent needs High: technology study in other market

[a] Stakeholder groups about which significant information was generated that was relevant to the project are listed in decreasing attention for the stakeholder group.
[b] Scrutiny is described for each of the stakeholder groups listed under 'scope'.

Top Management Commitment to Green Issues

The results show that the initial classification of the four cases on top management commitment to green issues was correct. The two cases that were assessed a priori as 'high commitment' yield an additional finding. In both cases, spillover of high commitment from top management to the entire organization occurred. The two cases with high top management commitment to green issues will be discussed first, followed by the two cases with moderate commitment.

The two 'high commitment' cases show similarity. For both Ecover (SquirtEco) and Gulpener (Limburgs Land) top management commitment to green issues is part of a larger commitment to other pro-social issues. Gulpener has embraced Corporate Social Responsibility (CSR) as a strategy, and uses the terminology and concepts found in this stream of thought. Ecover, on the other hand, was established with the initial purpose to develop phosphate-free laundry detergents, and developed its own concept of 'ecological hygiene' and 'safeness', which is based on the concepts of sustainabil-

ity (World Commission on Environment and Development 1987) and health, defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (World Health Organization 1946). Upon closer inspection, both firms are committed to a similar set of issues, next to green issues, such as employee wellbeing, fairness toward supply chain members, and community involvement. Furthermore, top management commitment to green issues takes a similar shape in both organizations in that they both have drawn up written statements that specify their environmentally pro-active policy. These statements, together with an 'esprit de corps' that was gradually established in both firms, have ensured that the commitment of the top management has diffused throughout the whole organization. Ecover has a member of top management dedicated to developing, safeguarding and disseminating the firm's sustainability and health 'concept', called a concept manager. The concept manager can be seen as an environmental champion who is consulted to solve moral dilemmas and acts as 'the company's conscience'. In both firms, evidence was found that the high commitment of top management had indeed spilled over to all other employees. The issue had been moved from a top-down control issue to an internalized principle and practice. A top manager of Ecover explained how discussion with employees and dealing with green issues in 'the Ecover way' became second nature for employees:

> "Once an employee has done this [dealing with green issues, PD] a few times, a sort of feeling develops how to tackle such issues. Then it becomes really an integral part of practice, and not something that is subject to some manager's control, where you have to go to in order to get a stamp of approval. And I think that that is one of the major differences between Ecover and other companies who try to be ecologically active. I think it is completely interwoven in our case."

The two 'moderate commitment' firms do not show signs of spillover. At the two firms selected with moderate top management commitment to green issues the top management does not take a proactive stance. This is not to imply that there is no commitment to green issues with top management. In both cases, top management's commitment can be best summarized as a combination of good citizenship and good business sense. At ChemCorp CR, top management commitment to green issues at the time that the case product was still embryonic was moderate. "Environmental issues are not in the focus of our attention", according to a top management informant in 1998, although the business unit did have a strong tradition of good citizenship. Informants report that top management commitment to green issues has somewhat increased since then, mainly because the perceived liability risks of failing to acknowledge green issues have risen. Especially the commitment to health issues has increased. Health issues are related to green issues, because they involve toxicity. The commitment to non-health related green issues has remained constant, informants claim.

Within Prins & Dingemanse, the top management is moderately committed to green issues, for reasons of self-preservation. Preservation of estuaries is crucial to the industry's survival, because it is both the source of its produce and also its 'manufacturing plant', because mussels that have been fished elsewhere are grown by the firm in the Oosterschelde estuary outside the processing plant for at least several weeks. Prins & Dingemanse, however, is not more pro-active than its competitors, in the as-

sessment of informants. Efforts to 'green' shellfishing are undertaken in an industry-wide initiative. Green special interest groups stirred a discussion about banning mechanical cockle fishing in the Wadden Zee, which received considerable national media interest during the period of data collection. The posture toward these groups is defensive. Furthermore, green issues are not a central element in the organization's mission, although an informant reported that the mission was reformulated after the data collection, to put more emphasis on green issues. A senior marketing executive explains the top management commitment to green issues as follows:

> "We have said to one and other clearly and frequently: our sources, they have to remain intact. One is not going to spoil… because then one is spoiling one's own source, one's own nest. Nature and environment are very closely linked to our activities. I don't mean the 'nature and environment' that is threatening to us, like groups who are calling upon us to almost cease all our activities, to stop fishing for cockles and mussels. That is the dark side of nature for us. The good side of nature, is nature as a life source for us. We are absolutely committed to that."

Thus, the findings regarding spillover of top management commitment to green issues are differ between moderate and high commitment. The case data suggest that diffusion of green commitment only occurs for high commitment. Diffusion of high top management commitment is noteworthy because it presents a potential mechanism by which top management commitment influences product innovation decisions taken in the organization. Although data were primarily collected about top management commitment, rather than organizational commitment, this finding yields some insight in how green issues permeate product innovation strategies.

Generic versus Project-Specific Stakeholder Orientation

The case data reveal that a distinction should be made between generic stakeholder orientation and project-specific stakeholder orientation. Generic stakeholder orientation refers to the information generation about stakeholders that takes place in the company, but that has not been shown to be relevant to product innovation strategy in the case data. Generic stakeholder orientation refers mostly to an organizational level higher than specific product innovation projects. The set of stakeholders about whom information is generated by the organization can be larger than the set of stakeholders about whom information relevant to product innovation strategies is generated. Although the study focuses on generating information that was relevant to the specific product innovation projects under investigation, the case data suggest that certain stakeholders are within the scope of the organization's stakeholder orientation but considered irrelevant to product innovation decisions for the case product. The information generation about 'irrelevant' stakeholders, however, *can* be relevant to other product development projects, or if that is not the case, contribute to a general understanding of a stakeholder. It is likely that a general understanding of a stakeholder, e.g. acquired through building informal relationships, leads to the generation of knowledge about 'what makes a stakeholder tick'. Such knowledge is possibly of a tacit nature, i.e. that the participants of a project are not aware of the knowledge but include it in their decisions regarding product innovation projects nevertheless (Leonard and Sensiper 1998). Generic stakeholder orientation is likely to be an antecedent to project-specific stakeholder orientation.

Proof of the distinction between generic and project-specific stakeholder orientation is observed particularly in the two organizations with high top management commitment to green issues. Ecover and Gulpener generated information about a set of stakeholders that includes market as well as non-market stakeholders. Information about some of these stakeholders was not deemed relevant for product innovation strategies by the case informants. Employees, for instance, were mentioned sporadically in the interviews, but these findings failed to be triangulated, and the informants suggested that the relevance of information about employees was little at best. At Gulpener, employees are considered a very important stakeholder in its CSR strategy, and through informal relationships and employee meetings information is generated about employees. This information is about working conditions and commitment to the CSR strategy and has no bearing on the product innovation strategy of the Limburgs Land product. At Ecover, employees were identified as an important stakeholder, and written norms are used to specify in great detail what information is generated (e.g., about job satisfaction, accidents, incidents, absenteeism, and equal opportunities), but is not relevant to the product innovation strategy of SquirtEco. As for SIGs, a difference between generic and project-specific stakeholder orientation is observed as well. Both Ecover and Gulpener generated information about SIGs, but this information was only relevant to the product innovation project at Ecover. Gulpener maintained close informal and sometimes formal relationships with representatives of the 'green movement' and thus generated information about the issues that were important to these SIGs, but these issues were more relevant to general firm strategy and manufacturing processes than to product innovation.

Project-specific stakeholder orientation did not include information generation about shareholders in any of the case studies. Some, but not much, evidence was found that generic shareholder orientation included shareholders. Because the data collection did not focus on generic stakeholder orientation it is possible that this study is not capable of developing a complete image of generic stakeholder orientation. The data show that generic stakeholder orientation can have a wider scope than project-specific stakeholder orientation, but the study cannot uncover the exact scope of generic stakeholder orientation. It should be noted, also, that three out of four firms are not publicly traded and have only one large majority shareholder. For the Mussel Bag and Limburgs Land cases, the shareholder played a direct role in the development of the product because in both cases the majority shareholder was the company's CEO at the time the product development project was embryonic. In these cases, the major role of the majority shareholder is a top management role, and is analyzed as such. At Ecover, the shareholder chooses not to 'micro-manage' the organization but endorses the firm's commitment to green and other pro-social issues. For the only publicly traded firm, ChemCorp, information about shareholders was found not to be relevant. It is likely that although shareholders interests will receive considerable attention in formulating the company's general strategy, shareholder considerations are not carried over to the more micro level of product development projects.

Systems, Tools, and Practices in Stakeholder Orientation

Several systems, tools, and practices are observed that companies use to generate information about stakeholders, and that provide insights on what a stakeholder orienta-

tion entails. More specifically, these systems, tools, and practices may be used to (1) increase the scope or (2) to increase the scrutiny in stakeholder orientation. Systems, tools, and practices are observed in the four product innovation projects, as well as outside these projects; in other projects or as part of the generic stakeholder orientation. Table 5.3 provides an inventory of all such systems, tools, and practices that were observed. The items that are marked with an asterisk in the table are specific to the case study projects. Not all items in the table relate to the product development project under investigation. Because of the potential importance for other GPI projects, and the potential to generate the tacit knowledge described above, systems, tools, and practices that were observed in the case studies to contribute to stakeholder orientation are also reported.

Table 5.3: Observed Systems, Tools, & Practices in Stakeholder Orientation

Component of Stakeholder Orientation	Stakeholder Group(s)	System, Tool, or Practice Observed in Organization
Scope:	Wide set of market and non-market stakeholders	Stakeholder management system (Ecover) Network of stakeholder experts (Gulpener)
Scrutiny:	Customers	Observation studies (ChemCorp)
	Competitors	Reverse engineering (Prins & Dingemanse*)
	Regulators	Early warning system (ChemCorp)
	SIGs	Dialogue (Ecover*) Expert source (Ecover*)
	Supply Chain Members	Informal relationships (Gulpener*) Dialogue (Ecover*)
	Other (other firms)	Cross-industry meetings (Gulpener) Frame breaking technology study in other market (P&D*)
	Other (research centers)	Patent screening (ChemCorp, Ecover*) Cooperation (Ecover*)

An asterisk (*) marks the organizations in which the system, tool, or practice was used in the studied product innovation project and studied in detail. All other items in this column refer to observations made about generic stakeholder orientation or about product innovation projects other than the case project.

Systems, tools, and practices to increase the *scope* of stakeholder orientation are found only on the level of generic stakeholder orientation. Moreover, they were identified only in the two firms with high top management commitment to green issues. This finding suggests that scope of stakeholder orientation is an important variable for understanding the strategies of these firms. In particular, two tools emerged from the data to increase scope in stakeholder orientation: Ecover's 'Stakeholder Management System' and Gulpener's informal network of stakeholder experts. Both are organizational tools to ensure the inclusion of non-market stakeholders in the scope of stakeholder orientation. These tools are not specifically relevant to the case products.

Ecover has developed a 'Stakeholder Management System'. This system is developed and maintained by the 'concept manager' and described in a 16-page document avail-

able to all employees. It specifies nine stakeholder groups in decreasing importance: 'humanity', 'nature', 'current customers', 'shareholders', 'employees', 'suppliers, subcontractors, and transporters', 'distributors', 'governments', and 'local residents'. For each stakeholder, specific goals and objectives are stated, as well as Internet hyperlinks to more information about each objective, and criteria and tools for, among others, information generation. Not all stakeholder groups mentioned above constitute a 'group or individual' (Freeman and McVea 2001), nor are they all mutually exclusive. The system, however, is a tool for Ecover to establish a wide scope in stakeholder orientation, to ensure that green and other pro-social issues are considered in product innovation projects and other decision domains, and to provide a priority ordering for stakeholder issues. Thus, the stakeholder management system is a starting point for information generation about stakeholders, but potentially also a coordination mechanism and prioritizing tool. The two latter purposes are discussed later in this Chapter, under 'process characteristics'.

The system that Gulpener uses is not as elaborate and formal as the Stakeholder Management System used by Ecover. Instead, Gulpener has established an informal network of stakeholder experts. The company uses this network as a sounding board. The member of the network include: a professor in marketing, a marketing communication consultant, the editor-in-chief of a magazine on sustainable development, a CSR consultant, and a delegate of an environmental protection group. Most of the relationships in the network are informal and without compensation. Furthermore, the company has relationships with regulators at the highest level. Since the company has won CSR awards it receives invitations from the national government to act as an information source for policy makers and politicians, which has resulted in meetings with the prime minister of the Netherlands and the speaker of the opposition. Although not explicitly identified in the case data, it is likely that such contacts act as an information source to the organization.

Systems, tools, and practices to increase the *scrutiny* in stakeholder orientation are observed on a generic and project-specific level. Recall that scrutiny refers to the quality of the generated information, i.e. the degree in which the information enables the organization to be pro-active. To increase scrutiny in customer orientation, one organization used observation studies. This practice is also proposed by Slater and Narver (1998) to increase the generation of high-scrutiny information. After realizing the importance of scrutiny in customer orientation, among others through the failure of Hardcoat, new practices to uncover latent needs were sought. One marketing executive explains the perils of collecting information about manifest rather than latent customers needs, clearly delineating the difference between low and high scrutiny information generation:

> "If you consider the product development process, we practice the 'famous' outside-in philosophy. I call it the 'outside-in trap', or 'customer trap', which we have fallen into. In the whole process we go out and ask our people in the field, and they at their turn ask the customers in the various countries: 'Which products do you need? What improvements do you envision?' If you arrive at the customer, the only thing that the customer can mention is the problem he had last week. In that way you will never make large steps with respect to innovation. That's why we are working on how to approach this issue better and differently,

to ensure that we collect input for the leap-frog innovations we would like to develop."

To avoid this 'customer trap', ChemCorp has introduced participatory observation studies. People involved in the product development, especially R&D managers, do week-long internships with their customers, the car repair shops. They are instructed to carefully observe the business processes, housekeeping, work flows, etc, while performing relatively simple menial labor in the repair shop, and to report their findings. These observations lead to a better understanding of latent customer needs.

High scrutiny information generating systems, tools, and practices are also observed with regard to other stakeholders. To generate information about future regulation as early as possible an early warning system was developed at ChemCorp. Selected executives in all markets monitor regulatory developments, e.g. by participating in industry association committees that meet regularly with regulators, and report back to a centralized department at corporate headquarters. To generate information that enables the firm to identify new greening opportunities, Gulpener participates in a cross-industry initiative organized by a SIG, an environmental protection group. The cross-industry initiative is a project in which companies with CSR strategies from different industries meet regularly. These different companies, not so much the organizing SIG, are a source of inspiration for greening opportunities that give the firm an edge. In this way, Gulpener generates information about a stakeholder group, 'other firms', not being competitors or supply chain members. The information generated has to date not yielded information relevant to product innovation, but resulted in ideas for process innovation. Therefore, this orientation toward 'other firms' is part of the generic stakeholder orientation for Gulpener.

The inventory of systems, tools, and practices that was presented above shows that information about several stakeholders is not only generated, but also differs significantly in the scrutiny achieved in information generation. The next two subsections elaborate on the scope and scrutiny, respectively, in project-specific stakeholder orientation.

Scope: Market and Non-market Stakeholders

The results regarding the scope of stakeholder orientation show that information about market stakeholders is always generated, and that it is sometimes complemented with information about various non-market stakeholders. In Table 5.2, the stakeholders about whom the organizations generated information that was relevant to the project are listed in decreasing order of the attention that was given to the stakeholder. At firms with high as well as moderate top management commitment to green issues, market stakeholders, being customers, competitors, and supply chain members, receive a good deal of attention in information collection. In all cases, customers and competitors were part of the scope in stakeholder orientation, reflecting the importance of an orientation towards market stakeholders for product innovation, as established in the extant product innovation literature. Supply chain members, another market stakeholder group, is part of the scope for all cases, except Hardcoat. The latter can be explained by the fact that the firm controls most of the supply chain itself.

Complementary to market stakeholders, however, attention was also devoted to information generation about non-market stakeholders in some cases. Not recognizing information generation about non-market stakeholders would paint an incomplete picture of the information generation efforts that are relevant to GPI strategies. A strong example is found for Hardcoat, where a significant orientation towards regulators was observed. At the time the project started, it was becoming increasingly clear that VOC limiting regulation was going to have a great impact on the industry in several parts of the world. Information from non-market stakeholders about which products would be allowed in what markets was therefore crucial to product development.

Proof of a market *and* a non-market stakeholder orientation is also found in the SquirtEco case. The widest scope in stakeholder orientation, encompassing an array of market and non-market stakeholders, was found in this case. The information that prompted the development project was that large, non-green, competitors were introducing ready-to-use all-purpose cleaning sprays and that there was a general trend in the market towards more convenient products. At the same time, the firm was researching biosurfactants technology in cooperation with several universities, in a government-subsidized research program. The technology had been noticed a few years earlier as a result of screening patents literature. Therefore, the organization is assessed to have an orientation toward a stakeholder group not identified in the theoretical model, i.e. research centers. The general label 'research centers' includes both the universities that cooperate in the biosurfactants program, as well as the research centers that filed the patents that led to the noticing of the technology. Patents as such are not stakeholders, because they do not constitute a "group or individual" (Freeman and McVea 2001). Furthermore, the firm receives information from one type of supply chain members, the health trade retailers. The health trade retailers constitute "the natural habitat of Ecover", according to an informant, and are highly committed to green issues. These retailers provide ample feedback about the firm's products, customer trends, etc. SquirtEco is the only case in which relevant information from SIGs was present. Ecover maintains relationships with several SIGs, and uses these relationships to get information that enable it to 'green' products, e.g. information from Greenpeace about which plastics are considered to have the least impact on the environment.

Additional proof of coexistence of market and non-market stakeholder orientation is found in the Mussel Bag case. In the project, the scope of stakeholder orientation included a mix of market and non-market stakeholders. In the Mussel Bag case, informants mentioned a stakeholder group, 'other firms', previously not identified in the conceptual model. This stakeholder group was also observed in the generic stakeholder orientation for Gulpener. In the Mussel Bag case, 'other firms' were an information source relevant to the product innovation project, whereas this stakeholder yielded only process-related information in the Gulpener case. As Prins & Dingemanse had been experimenting with non-leaking packaging for fresh mussels for a long time, its attention was drawn to another firm in the food industry. A producer of potato fries developed a conditioned packaging for refrigerated fries, rather than the mainstream deep-frozen fries, and managed to establish a new market. Studying this example prompted the firm to start its own experiments on conditioned packaging.

This stakeholder group is labeled ‘other firms’, i.e. firms not being competitors or supply chain members.

Scrutiny: Low and High Quality of Information

The results regarding the scrutiny of stakeholder orientation show that, although low scrutiny prevails in the four case studies, it is possible to generate high quality information about many stakeholder groups. Table 5.2 shows that those stakeholder groups that received the most attention, i.e., that were strongest represented in the *scope* of the stakeholder orientation, received only low scrutiny. Yet, the table also shows that information generation about stakeholder groups that are at the bottom of the lists, is sometimes undertaken with high scrutiny. The Hardcoat case, for instance, demonstrates the difference between scope and scrutiny. Whereas customers were very prominently within the scope of the organization's orientation, the organization only later learned to look at customers’ needs with more scrutiny through observation studies. The experience with Hardcoat made the organization aware of the importance of high quality information. These findings present evidence that scrutiny can be distinguished from scope, and thus support the operationalization in the theoretical model.

The results in Table 5.2 display variation in the scrutiny with which information about a stakeholder group was generated. In none of the cases, firms generated high-scrutiny information about customers. There are indications that for some product innovation projects, it is more difficult to generate high scrutiny information than others. Informants for Mussel Bag point out that, due to the radical nature of their project, it was more difficult to establish how much willing to change customers would be. The data for Hardcoat point to a similar conclusion: it is difficult to establish how much behavioral change customers are willing to make. Furthermore, data from the Mussel Bag case suggest that for green products, an additional hurdle to generating high scrutiny information is introduced. This is caused by the difference between stated behavioral intentions and actual displayed behavior by consumers concerning green issues. This brings up the question whether it was at all *possible* to generate information with high scrutiny about customers in the cases, or that the criteria for high scrutiny information used in this study (enabling pro-active product innovation strategies, uncovering latent needs) are simply not realistic.

The case data for Hardcoat give the best answer to this question. Informants at ChemCorp pointed out how information generation had improved since the development of Hardcoat. This creates a suitable basis for comparison in the analysis, showing that scrutiny in information generation about customers was low, whereas it was realistically possible to generate information with high scrutiny instead, as the following narrative illustrates in more detail. Marketing informants call Hardcoat a ‘technology driven’ not ‘market driven’ innovation. It was, however, developed with some consideration for customers. The information about customers was not complete, though. This suggests that scrutiny was low. Several informants at ChemCorp used the present information generation practices as a benchmark to compare the information generation for Hardcoat to. All informants agreed that the organization had been lacking in collecting good information about customers and regulators when Hardcoat

was developed. One informant gave a vivid historical account about how information generation had improved over the years. At the time of the development of Hardcoat, the business unit had changed from a technology-driven organization to a more market-oriented organization. The focus at the time of development of Hardcoat was at developing products that could increase the productivity of its customers, car repair shops. Whereas this was the result of a developing customer orientation, the organization's understanding of customer needs was still insufficient, as the following quote from an R&D manager illustrates:

> "In the past we have looked exclusively at the paint and the products, the assortment: 'do we have all colors, is everything working?' When we started working on Hardcoat, we thought: 'we should look at more aspects; how do we deal with the productivity of our customers?' This productivity issue broadened our view. So we knew more about customers. Was that enough? No, there was yet another factor. It had to do with efficiency. Which is to be found in the customer's business processes and logistics. And there was really a much larger issue: how do our customers get their paint jobs?"

The lack in scrutiny in customer orientation resulted in several customer needs being misread. Hardcoat's advantage of time reduction was only relevant for a small group of car repair shops. Because product tests were performed with innovative customers, the resistance to change paint application practices at car repair shops was underestimated. Latent needs of customers, related to the fact that major improvements at car repair shops were to be found in improving their business processes, rather than productivity enhancements through faster paint, were not recognized at the time. Only later analyses, performed after Hardcoat had been developed, revealed these customer needs. This proves that it is possible to generate high scrutiny information about customers, and therefore that the distinction between low and high scrutiny is meaningful.

Another telling example of low scrutiny in customer orientation is found in the Limburgs Land case. Although information is generated about customers, this was done with little other empirical support than generally observed trends and impressions, as witnessed by the following quote:

> "If you look at the ecological beer drinker, I have the impression that you will find, how to say, a lot of conviction, zeal. Ecological drinking is done out of a conviction, but not so much because it tastes good. Gulpener beer, on the other hand, is drank, I think, by people that also appreciate the good taste. There's a balance: [conviction and] tasting good. […] This is our perception. We did not do market research into that. […] This is common practice in the firm. We sit around the table with four or five people with some bottles on the table, and we ask each other: 'does it make your heart run faster?'"

Some of these trends and impressions were cross-checked with the expert network, but very little primary research was done with consumers. Furthermore, the product was introduced with no testing, except sensory testing by the firm's top management. Informants claim that the reasons for limited scrutiny in customer orientation are limited resources for market research, caused by the size of the product. Similar explanations are given in the two other small organizations, Ecover and Gulpener. Moreover,

informants at Gulpener point to the fact that development and introduction costs, and therefore the associated risks of introduction, are kept very low. In this case, there are ample opportunities to improve the quality of the information that was generated, again showing that achieving higher scrutiny in customer orientation is realistic.

Regarding regulator orientation, a situation similar to the one regarding customer orientation is found in the Hardcoat case. Information about pending regulation was recognized as important, and new regulation monitored, but higher quality information *could* have been generated. The final version of Dutch VOC regulation for car refinishes in 1998 was different than expected. In the analysis of an R&D informant:

> "We were not really surprised. We just had not been listening well enough at all times".

At that time, Hardcoat was under development, and since it was developed to be an ultra low VOC paint it would comply with the most stringent of regulations. What the organization had failed to recognize, however, that the new Dutch regulation would push the market toward waterborne basecoats, a technology that Hardcoat was not compatible with. The Dutch regulation was eventually used by the European Union as a basis for EU-wide regulation, pushing the whole Western European market toward waterborne products. Informants retrospectively concluded that the firm could and should have recognized the general trend toward waterborne products. Marketing informants commented that they had recognized the start of a move toward waterborne products, but nobody had foreseen the level of stringency of new regulation at the beginning of the project. When marketing executives started to recognize the 'waterborne trend' this information was not incorporated into product innovation decisions. This is, however, due to the coordination mechanisms used, which will be elaborated upon in the next section.

Opportunities for generating information with high scrutiny are also observed for other stakeholder groups: competitors, supply chain members, SIGs, 'other firms', and research centers. High scrutiny information generation about competitors is found in the Mussel Bag case, where the firm applied reverse engineering to competitor's packaging. Reverse engineering in this case is not applied to simply copy a competitor's product, but to gain insight what R&D directions competitors have taken. In this fashion, reverse engineering assists the firm in being proactive rather than reactive, and is assessed as high scrutiny. In the SquirtEco case, information about supply chain members was generated by the establishing dialogues with highly involved health trade retailers, who would approach Ecover with new product ideas and suggestions for 'greening'. Information about supply chain members, now from the supply side, is generated with high scrutiny in the Limburgs Land case, by established long-term, informal relationships with raw material suppliers, to the point that long standing information exchange with a barley supplier prompts the supplier to proactively start to grow organic barley. High quality information is gained from SIGs in the SquirtEco case by actively seeking dialogues with these groups, and recognizing some environmental protection groups as valuable sources of ecological knowledge. These contacts are formal ("we do not visit each other to drink a cup of coffee", according to an informant), contrary to the relationships found in Limburgs Land. In-

formation about 'other firms' is generated with high scrutiny for Mussel Bag by establishing contact with a firm in a different, non-competing, market that has introduced a new technology to study their technology. Research centers are a source of high scrutiny information for SquirtEco by systematically screening patents and seeking cooperation with leading research groups at universities.

Above evidence shows that low scrutiny in information generation about customers can be avoided, and that systems, practices, and tools exist for generating information with high scrutiny about the stakeholder groups competitors, regulators, SIGs, supply chain members, 'other firms', and research centers within the context of product innovation projects. The distinction between low and high scrutiny in information generation for product innovation is meaningful.

5.3 Process Characteristics

Analysis of process characteristics confirms coordination and priority of green issues as two distinct constructs, and reveals several coordination mechanisms, differing in their degree of formalization, and several approaches to attach priority to green issues, differing in the degree in which green issues prevail when trade-offs between green and non-green issues are encountered. Table 5.4 provides an overview of the findings.

Table 5.4: Innovation Process Characteristics

Case	Coordination of Green Issues	Priority of Green Issues
SquirtEco	High, using various methods, including two environmental champions and discussion. Many issues.	High (though not to the extreme), using a combination of many approaches.
Hardcoat	Moderate, using green objectives and env. task force, but limited to input from R&D dept. Issues: VOC and toxicity.	Moderate, using non-green motto, balancing, and constraints.
Limburgs Land	Low, using objective by environmental champion with little other coordination. Issues: organic and local ingredients.	High, using ecolabel standards, benchmarking, specific issues (exceeding ecolabel standards).
Mussel bag	Moderate, using environmental champion, with minimal coordination later in process. Issues: mainly packaging waste.	Low, using elimination by aspects.

From the table can be read that coordination of green issues is conceptually different from priority of green issues. This is most clear from the Limburgs Land case, in which low coordination and high priority for green issues are found within the same project. Coordination of green issues refers to the degree in which green issues are integrated in the project's innovation process. It involves communication in the project team to ensure that green issues are taken into consideration. Priority of green issues refers to the priority that green issues receive in decision making when the team encounters a trade-off between green and non-green issues. In summary: coor-

dination determines how and which green issues are included in the process, priority refers to the weight assigned to those green issues in making trade-offs.

Coordination of Green Issues

Coordination is observed to be both intra-functional (e.g., between R&D participants of a project) and inter-functional (e.g., coordination between R&D and marketing, Health, Safety & Environment (HSE) and R&D). To achieve integration of green issues in the innovation process, a variety of mechanisms have been observed. From the cases can be concluded that organizations are attempting to include green issues in the process in varying degrees (see Table 5.4), adding to the reliability of the operationalization in the theoretical model.

Data from Hardcoat show how coordination is different from scope and scrutiny in stakeholder orientation. Although information about regulators was generated with low scrutiny, at a certain point in time the marketing department was the first to recognize that the market was going to develop toward more waterborne products. Marketing played a relatively limited role in the innovation process for Hardcoat, however, and information on this green issue was not used in the process. The project continued to develop a clearcoat to be compatible with an older, solvent borne basecoat, rather than a waterborne basecoat. Marketing informants displayed frustration about the failure to include information about regulatory and market development toward waterborne technology in the innovation process. From this example, it is apparent that stakeholder orientation is a different construct, relating to the generation of information, from coordination, which relates to the use of information about green issues in a specific project.

Table 5.5 reports on the coordination mechanisms for green issues encountered in the case studies. The coordination mechanisms range from specific instructions to include green issues in the innovation process, such as written norms or stated objectives in a product profile that is drawn up at the start of the project, to organizational arrangements, such as teams consisting of or meetings with participants from different domains and perspectives on green issues. The identified coordination mechanisms differ particularly in their degree of formalization (Moenaert et al. 1994; Olson et al. 1995; Griffin and Hauser 1996). The most formal coordination mechanisms are listed at the top of the table, the least formal at the bottom.

SquirtEco is a particularly interesting case, because a diverse mix of coordination mechanisms is employed, combining highly formal with highly informal coordination mechanisms. The SquirtEco case shows that one way to achieve high coordination is by combining various coordination mechanisms. Not all mechanisms, however, have to be used to their full potential in order to achieve high coordination of green issues. In the SquirtEco project, Ecover's Stakeholder Management System was used as a critical fall-back checklist, in case a green issue needed clarification. It was available for everybody through the company's computer network. Also, a procedure that prescribed a document being processed by all departments involved in a product development project was not completely followed. At the time of development of

SquirtEco, this procedure was new, and as not all departments were familiar with it, they neglected to fill in their parts of the document.

The variety of coordination mechanisms at Ecover implies that some redundancy is built in the product development process, which helps to ensure that a minimal level of coordination of green issues is safeguarded. Not all little-used mechanisms are redundant, though. Because the product development document did not follow entirely the mandated procedure, one green issue (the environmental impact caused by the trigger spray that was chosen) was overlooked. By fully employing this coordination mechanism, this would have been prevented, according to informants.

Table 5.5: Identified Green Coordination Mechanisms

Mechanism for Coordination of Green Issues	Description(s)	Observed In Case
Generic written norms	Guidelines on how to select fragrances	SquirtEco
	Statement of norms for animal testing	SquirtEco
Project-specific objectives	Objective for maximum VOC level in product profile	Hardcoat
	Objective to develop organic product from local ingredients	Limburgs Land
Procedure	Process development document with built-in checkpoints	SquirtEco
System	Stakeholder management system, listing all green issues	SquirtEco
Environmental task force	Product stewardship group for eco-efficiency improvements	Hardcoat
Environmental champion	Concept manager and head of HSE dept. monitor project	SquirtEco
	CEO emphasizes green issues in project group	Limburgs Land
	R&D manager looks for further reduction of packaging	Mussel Bag
Team composition	R&D and marketing depts. both involved to assess green issues	SquirtEco
Discussion	Frequent discussion of green issues in project meetings	SquirtEco

Note: coordination mechanisms are ordered in decreasing degree of formalization.

Low coordination, on the other hand, is witnessed in the Limburgs Land case. After the initial objectives set by the environmental champion, the manager responsible for R&D set out to develop the product on his own, without any further coordination of green issues. From this example, it becomes clear that a coordination mechanism is not associated *per se* with a certain degree of coordination. An environmental champion can exert a lot of influence on a process and ensure that many green issues are considered continuously, or its influence can be limited to brief episode of the process. Overlooking the results in Table 5.4 and Table 5.5, there is no reason to conclude that some mechanism is better in achieving high coordination of green issues than others. The data on SquirtEco suggest that a *combination* of mechanisms is better to achieve high coordination.

Priority of Green Issues: Resolving Trade-offs Involving Green Issues

Trade-offs involving green issues are often encountered in GPI projects. In all four cases, such trade-offs were observed, although in one case there was a perceived trade-off that the project team eventually managed to circumvent. The variable 'priority of green issues' deals with how these trade-offs, whether they be perceived or real, are resolved. Several approaches to resolving trade-offs between green and non-green issues are found to be used in the innovation process, sometimes in combinations.

Several types of trade-offs involving green issues were found in the four cases. Following are four examples of different trade-offs, to provide a better understanding of the decisions that a project team is facing when developing a GPI:

- *Trade-off between green issue and functionality.* In developing Hardcoat, the project team was faced with a trade-off between VOC level and ease of application. Products with a higher VOC level, i.e. more solvents, are easier to apply for users.

- *Trade-off between green issue and costs.* In developing Limburgs Land, the project team was faced with a trade-off between the use of organic ingredients and product costs. Organic barley is considerably more expensive than regular barley, while organic hops are even up to seven times more expensive. Moreover, producing organic beer puts a higher burden on administrative processes, which contribute to costs.

- *Trade-off among green issues.* In developing SquirtEco, the project team was faced with a trade-off between not using ingredients that had not been tested on animals in the recent past and using a new biodegradable ingredient. The new biodegradable ingredient has to undergo some animal testing before being admitted to the market.

- *Trade-off between green issues on a micro level and on a macro level.* In developing SquirtEco, the project team was faced with a trade-off between improving on a green issue, The team could have decided to make SquirtEco a undiluted product that customers had to mix with water before use, thus saving packaging and improving greenness. However, it is likely that more people will buy non-green main stream products, rather than SquirtEco if the greener, undiluted, version of SquirtEco is introduced. The environmental impact on a macro level can very well be *bigger* if the product is undiluted. Thus, a greener product can lead to more environmental impact on a macro level.

The analysis focuses on the trade-off between green and non-green issues, rather than the trade-off between green issues. The trade-off between green and non-green issues is likely to have the gravest consequences for the whole product, impacting other innovation characteristics than greenness (relative advantage and product costs). Some of the trade-offs between green and non-green issues are eventually circumvented. In most of the trade-offs, however, choices must be made which of the two prevails, the green issue or the non-green issue, and to what degree the non-prevailing issue is

traded off against the prevailing. This is what is dubbed high, low, or moderate 'priority of green issues' in Table 5.4.

Table 5.6 lists approaches for resolving trade-offs that are identified from the four case studies. The results indicate that organizations have chosen very different approaches of assigning priority to green issues over non-green issues. Some approaches use a compensatory decision rule (e.g., balancing), some a non-compensatory (e.g., elimination by aspects), and other practices leave the choice between a compensatory or non-compensatory decision rule open (e.g., explicit issues, stakeholder priorities) (cf. Bettman et al. 1991; Seppälä et al. 2002). However, the most important discriminating factor underlying the resolution of trade-offs seems to be the degree in which green issues prevail over other issues. As noted in literature discussing decision analysis from a life-cycle assessment perspective, "the issue is not so much compensatory versus noncompensatory, but rather of the degree of compensation that different methods allow" (Seppälä et al. 2002). The life-cycle assessment perspective only deals with how to compare green issues among each other, whereas this study provides insight in trade-offs between green and non-green issues. While some approaches for resolving trade-offs between green and non-green issues are more likely to yield outcomes in which green issues prevail (e.g., resisting undesirable products), other approaches are neutral in this respect (e.g., balancing).

Table 5.6: Identified Approaches for Resolving Trade-offs

Approach for Resolving Trade-off	Description(s)	Observed In Case
Resisting undesirable products	Not develop product when becomes clear that a green alternative is not feasible (inherently non-green product).	SquirtEco
LCA/Quantifying environmental costs	Analysis of env. impacts on quantifiable, normalized dimensions	Hardcoat
Stakeholder priorities	Rank-ordering of stakeholders (with associated issues) in the Stakeholder Management System	SquirtEco
Ecolabel standards	Comply with standards of the EKO trademark and Dutch Ecolabel	Limburgs Land
Benchmarking	Mainstream non-green products are a lower benchmark Own non-organic lager is benchmark for taste	SquirtEco Limburgs Land
Explicit issues	Performance, price, convenience, health, and sustainability are specified as main dimensions Local ingredients are selected	SquirtEco Limburgs Land
Balancing	Optimizing green issues vis-à-vis non-green issues Optimizing green issues vis-à-vis non-green issues	SquirtEco Hardcoat
Constraint	Maximum VOC level	Hardcoat
Elimination by aspects	Most important functional aspect is dealt with first, and only as this has been solved, green issues are tackled	Mussel Bag
Non-green motto	'People who are Best at creating Bodyshop Profitability', i.e. functional performance is paramount	Hardcoat

The case data suggest that organizations sometimes use combined or phased strategies, in which several approaches are used in conjunction (cf. Bettman et al. 1991). In the SquirtEco case, the initial stage of the innovation process was a discussion whether the product should be developed at all. The discussion involved a trade-off between convenience and the amount of packaging. Because ready-to-use all-purpose cleaners are essentially a diluted version of regular all-purpose cleaner, the packaging to product ratio is relative high. Environmental impact would be reduced if consumers would not use ready-to-use all-purpose cleaners at all. Faced with other similar trade-offs, Ecover has sometimes opted not to develop a product, because it was not able to make ecological improvements that were large enough to compensate for the inherent negative effects of a product (e.g. ironing water). The company simply does not wish to develop and market such a product. In the SquirtEco case, the decision was made to proceed with the development because a large enough improvement was possible if biosurfactants were used. After the initial discussion about whether to develop the product at all, other approaches for resolving trade-offs were used in combination.

Encountering trade-offs in the initial stage of product development can also take an opposite direction than it did in the SquirtEco case. In the Mussel Bag case, green issues were 'dropped'. Before developing Mussel Bag, the firm had tried out numerous other concepts for non-leaking mussel packaging. After a few failed attempts, the project team for Mussel Bag decided to let non-green issues prevail to reduce complexity during the development, and succeeded in developing a product that had a good functional performance, i.e. using conditioned packaging. After they succeeded in developing a conditioned packaging technology for mussels, it was easy as well as cost saving to minimize the amount of packaging, and green issues returned into the project's decisions.

Informants suggest however that such 'free lunches' are rare and getting rarer. Customers demand products that conform to larger sets of requirements. Consumers seem less willing to trade-off green issues and non-green issues, and want both. Larger sets of requirements make resolving the trade-offs more important but also limit the degrees of freedom. Too high green priority might force the firm in an unviably small niche, whereas too low green priority might lead to failure in acknowledging crucial stakeholder issues.

Relationship Between Coordination and Priority of Green Issues

There is evidence of a relationship between coordination of green issues and priority of green issues, as specified in the model. However, the data also show that priority of green issues cannot be explained uniquely from coordination of green issues. The SquirtEco case provides evidence for a positive relationship between the two process constructs. The following statement of an informant for SquirtEco illustrates how increased coordination of green issues in the organization, in this case particularly through procedures, interdepartmental discussion and team composition, led to higher priority being given to green issues:

> "We used to have very much a 'one department show' in the past. For instance the marketing department wanted to introduce a certain product, and if that was a product that we all could endorse, and if that was a concept that R&D was willing to follow-up on, then the rest wouldn't matter so much. The kind of packaging didn't matter so much. Other ecological considerations carried less importance or were only highlighted sporadically. By coincidence really. Nowadays they are reviewed systematically."

Moreover, the SquirtEco case shows how a combination of formal and informal mechanisms, with built-in redundancy, secures high priority being given to green issues during product innovation projects. It is likely that high coordination utilizing a combination of coordination mechanisms leads to more green issues being considered, which in turn makes it likely that the added weights of all those issues are higher than when fewer issues are included.

The associative pattern reported in Table 5.4, however, reveals that low coordination can coincide with high priority of green issues. This is true for the Limburgs Land case. Therefore, coordination of green issues alone cannot be the only cause for priority of green issues. Another antecedent in the model, top management commitment to green issues, can be the cause of high priority of green issues in this case.

5.4 Product Innovation Characteristics

Product innovation characteristics for the theory-testing cases are operationalized in the same way as for the theory-building cases (see Table 5.7 for results). The analysis reveals two results. First, findings support the assessment of greenness at the time of case selection, and offer a refinement of the operationalization of newness to the firm. Second, the product innovation characteristics show outcomes of the product innovation processes, and thus reveal how trade-offs between green and non-green issues were finally resolved. The findings present evidence of a 'free lunch', in which a trade-off between green and non-green issues has disappeared in a breakthrough innovation.

Operationalization of Greenness and Newness to the Firm Revisited

The problem identified in Chapter 2 concerning the operationalization of greenness, is no longer present, because cases were selected in which an 'objective' third-party assessment of greenness was available for the product. In this manner, 'greenness' is a selection variable for the theory-testing cases. Similar to the approach for the controlled construct top management commitment to green issues, greenness is also assessed from the case data. A more careful understanding of greenness is necessary for obtaining logical argumentation to support or reject the possible relationships of greenness with other model constructs. Based on the case documents and the perceptions of the informants, all products are assessed to be 'high' on greenness, although none of the products is 'very high'. The latter implies that there is room for some improvement on green issues in all four of the cases. The room for improvement was most noticeable for SquirtEco, because informants in the organization considered the product to be one of the relatively 'less green' products in the portfolio. For the other three products, the informants were able to envision further green improvements, af-

ter being probed by the interviewer. Greenness is supported to be a meaningful and operationalizable construct.

The results for newness to the firm shed additional light on operationalization of this variable. For SquirtEco, Hardcoat, and Mussel Bag, the product innovation was new to the firm from a technical perspective; the innovation required significant changes in manufacturing processes, equipment, and/or layout. For Limburgs Land however, the degree of newness to the firm is almost entirely determined by changes of an administrative nature. The requirements by the organic certification body imply that the organization has to keep a detailed administration of all inputs and outputs, which required administrative staff to adapt its practices. Newness to the firm can be thought of as having two subdimensions, technical inexperience and administrative inexperience (cf. Green et al. 1995).

Trade-Offs Between Green and Non-Green Issues: A 'Free Lunch' Exists

The results show the existence of a 'free lunch' green product (cf. Walley and Whitehead 1994; Palmer et al. 1995), i.e. a product that is green, has advantages to customers that existing competing products do not have, and is cheaper to produce than other products. The 'free lunch' product is Mussel Bag, which signified a breakthrough for the entire shellfish industry.

In this case, it was possible to develop a product innovation that lowered resource use and improved functionality, as predicted in some literature (e.g., Porter and Van der Linde 1995a; Von Weizsäcker et al. 1997). In all three other cases, the remnants of trade-offs between green and non-green issues are discernable. The clearest of such trade-offs can be observed between the 'greenness' and 'product cost' columns in Table 5.7. Other remnants of trade-offs between green and non-green issues are between greenness and relative advantage. A tradeoff between greenness (VOC level) and relative advantage (ease of application) is clear from Hardcoat, as the following quote illustrates:

> "It [Hardcoat] is a 250 VOC product, which means very little solvents. This makes any product more critical. The lower the VOC, the more critical in use the product becomes, and the more responsibilities and skills are demanded from a car sprayer."

Above trade-offs confirm the relationships between greenness and product cost, and between greenness and relative advantage in the theoretical model. For Mussel Bag the relationships do not hold, which suggests that a high level of newness to the industry can change the other relationships. The case data do not offer enough evidence to either prove or disprove this conjecture. Mussel Bag is likely to be more of an exception than the rule, given that it is a technological breakthrough product, which by its very nature is rare. The case data therefore suggest that a 'free lunch' exists, but only in specific situations, under the condition of 'structural similarity' (see Chapter 4).

Table 5.7: Product Innovation Characteristics

Case	Greenness	Newness			Relative Advantage	Product Cost
		Newness to the Industry	Newness to the Firm	Newness to the Customer		
SquirtEco	High, biodegradable ingredients	Moderate/high, copied competing products but new technology	High, new production technology for bio-surfactants	Low, similar to existing competing products	Low, performance & convenience equal to competing products	High, variable: bio-surfactants and trigger spray
Hardcoat	High, ultra low VOC and energy savings	High, patented new technology	High, manufacturing of new resin	High, different application, routines, and required equipment	Low, incompatible with waterborne basecoat	High, fixed: intensive and lengthy R&D; var.: expensive resin
Limburgs Land	High, organic ingredients, integral approach	Low, similar products existed	Moderate, administrative eco-label requirements	Low, similar products in product category	Moderate, offers combination of organic, local, and taste	High, variable: certified organic ingredients
Mussel bag	High, less packaging, transport efficiency	Very high, patented and breakthrough technology	High, new logistical concept, equipment	Moderate, required adaptations and overcoming of misperceptions	Moderate, slightly outperforms mussels in other non-leaking packaging	Low, variable: material savings

Products Reflect Increasing Requirements

Although remnants of trade-offs between green and non-green issues are apparent from Table 5.7, the results in the table do not well reflect how all four product innovations have relatively complex green attributes and are bundles of various relative advantages. When studying the product innovation processes, informants reported a perceived in crease in the requirements that customers were making to them, along with a decreasing willingness in the market place to compromise one advantage to gain another. This holds for trade-offs between green and non-green issues, as well as trade-offs among several aspects of relative advantage. Informants for SquirtEco, for instance, reported how customer demands were perceived to be increasingly directed at products that combine greenness, high performance, and high convenience. Apparently, customers increasingly want to have their cakes and eat them. This is reflected in the findings on relative advantage for all four cases. Mussel Bag for instance, is a product slightly outperforming competing products on all quality dimensions – a result triangulated by an independent test of the Dutch Consumer Association (Consumentenbond 2004) – and equal convenience. Hardcoat seems an exception, but is in reality a complex bundle of advantages (such as increased speed and gloss, which used to be a mutual trade-off before Hardcoat) and disadvantages (such as incompatibility with waterborne technology). It is assessed as having low relative advantage, because the advantages are almost compensated by the disadvantages. Nevertheless it shows how the product incorporates improvements on multiple fronts at the same time.

5.5 Introduction Characteristics

According to some informants, the real challenge in GPI strategy lies in introducing, rather than developing the product. In the words of a top manager of Ecover:

> "The point is that it is difficult. If you consider green marketing in its entirety and the development of Ecover, then product development turns out to be the easiest part of the whole shebang. It's really communicating the message and finding a distinct image: those have been the two most difficult things, and they still are."

The theoretical model proposed two constructs pertaining to GPI introduction, green targeting and green positioning, to capture the introduction strategies of the case products. As these constructs differ from the initial constructs employed in the theory-building cases, it is all the more important to establish whether the constructs are meaningful and operationalizable. Results about introduction characteristics are illustrated in Table 5.8. For green targeting, as well as green positioning, a distinction can be made between the *degree* of green targeting or positioning, and *practices* employed. This distinction improves the operationalization of both constructs, and is necessary for understanding the relationship between the two constructs.

Degree of Green Targeting

Green targeting is the degree in which the targeting specifically includes customer groups that have a preference for green products. It is operationalized as a continuum

ranging from only targeting customers that do not have a preference for green products at all, to targeting customers who have a preference for green products that is so strong that they are willing to forego other benefits (e.g., convenience, economy, performance). This continuum is readily recognized from the case data. Informants for SquirtEco refer to distinct segments in its marketing strategy, called 'dark greens'

Table 5.8: Introduction Characteristics

Case	Green Targeting	Green Positioning
SquirtEco	High/very high, both deep green and light green segments, using green targeted channels	High, primarily as natural and powerful cleaner, secondarily: many green issues
Hardcoat	Low, niche of highly professional customers with spraybooth at full capacity and not using waterborne system	Low, primarily on drying time and gloss, secondarily as compliant with green regulation
Limburgs Land	High, mostly light green segment (organic), using green targeted channels	Low/Moderate, primarily on hedonic features within organic product class
Mussel bag	Low, customers of innovative retailers	Low, primarily on hedonic features and freshness

and 'light greens', as illustrated by the following episode from an interview with a senior marketing manager:

> "It's really simple: light green and dark green. *These* [pointing at left-hand side of a figure in marketing manual] are the people who are prepared to make a compromise, and *these* [pointing at right hand side] are the people who are not prepared to make a compromise."

Green targeting of SquirtEco is almost, but not entirely, at the furthest extreme of the continuum. Ecover, the focal organization in the case, used to target only deep green customers who are willing to settle for products with very low functional performance and/or convenience in return for greenness, like some of its competitors still do. SquirtEco, like most of the firm's products nowadays, is targeted at both deep green customers as well as light green customers. The targeting of SquirtEco is different from the next product on the continuum, Limburgs Land. In this case, only light green customers are targeted.

The target group for Mussel Bag is defined by the informants in terms of distributors, not end-users. The product was targeted at innovative food retailers, mostly supermarkets, to replace the old leaking mussel packaging. Whereas this targeting may have included some more environmentally conscious retailers, this was not a specific aim of the targeting. Although all Zeeland mussels are strictly speaking organic food, retailers specialized in organic food are not targeted at all.

Hardcoat, finally, is targeted primarily at non-green customers. The targeting is restricted to a niche of highly professional car repair shops because the product only

offers advantage to that particular group. Interviews and documents reveal that the customer profile that was composed for the product is complex. One of the aspects in the profile is the non-adoption of waterborne systems and compliance with VOC regulation. Green customers are mostly switching to waterborne basecoats, which are incompatible with Hardcoat. The product is therefore targeted at the remainder of customers who wish to continue using solvent-borne basecoats and are looking for a combination of basecoat and clearcoat that complies with VOC regulation. Because of the ultra low VOC level of Hardcoat, customers can use a high VOC level basecoat and still comply with regulation (if the regulation permits averaging the VOC levels of the two coats). Paradoxically, a rather green product is targeted at customers whose willingness to compromise functional performance for greenness is lower than others. This non-green targeting is not the far most extreme of the continuum, because competing products exist that are targeted at customers who choose *not* to comply with regulations. This was the case in the United Kingdom, where VOC regulation was not strictly enforced.

The four cases on the continuum, as well as the fact that both extremes of the continuum can be distinguished by considering competing products, lend support to the operationalization of the green targeting construct as the degree of green targeting.

Green Targeting Practices

A green targeting continuum does not tell the whole story, however. In two of the case products, SquirtEco and Limburgs Land, a more specific targeting practice is identified. Both products are marketed, though not exclusively, through specialty stores that themselves target green segments. These specific channels are mostly referred to as health trade stores. Health trade stores are green outlets by nature, and have a more homogenous customer base than supermarkets. Choosing for specialty stores like health trade stores is not simply associated with targeting a deep green customer segment. In fact, both light green and deep green customers visit these outlets. SquirtEco is marketed through the health trade to both deep green and light green customer segments, and through supermarkets to a light green segment. Limburgs Land, on the other hand, is marketed through the health trade *only* to light green customer segments, and for a small part through supermarkets. This practice ensures that a homogenous target group of customers who value green issues more than average, be it a light green or a deep green segment, is included in the green targeting. Acknowledging this practice leads to an operationalization of green targeting in two dimensions: the degree in which green customers that have a preference for green products are included in the targeting, *and* whether the targeting is reinforced by using channels that themselves are targeted toward greener customers.

Degree of Green Positioning

The case data show support for the operationalization of green positioning in this study, and again reveal that green positioning can be described in a more detailed and meaningful manner by not only considering the degree of green positioning but also the practices that were employed in positioning. These results are described below (see also Table 5.8).

The introduction strategies observed in the theory-testing case studies show that green positioning does not involve an either/or choice. Instead, green positioning reflects the degree in which green attributes of the product are placed at the forefront of marketing communication in the introduction strategy. It is the relative weight of green issues in the positioning that differs significantly between cases. The relative weight of green issues in the positioning of SquirtEco is considerably higher than for the three other case products. It is positioned as a natural powerful cleaner, thus combining green and non-green aspects, and using communication on many secondary green aspects as support. In the past, many of Ecover's products were positioned only using green aspects. Informants report a shift in positioning over the last years throughout the whole product portfolio. As observed in green targeting, target groups increasingly want 'to have their cakes and eat them', and some firms have adapted their positioning to match, telling their customers that this is exactly what their products allow them to do.

Three of the case products are positioned primarily using non-green attributes. Limburgs Land and Mussel Bag, both food products, are primarily positioned on their hedonic features, but their respective positionings are different with regard to one aspect. Whereas Mussel Bag is positioned on hedonic features and freshness vis-à-vis the entire competition, Limburgs Land is positioned as the most enjoyable and high-quality beer *within* the product class of organic beers. It was a deliberate choice of the managers involved, however, *not* to emphasize the fact that the product is organic. A high green positioning, which the managers perceived to be the case with other organic produce such as organic fruit and vegetable, was carefully avoided. The core of the product offering should be to offer enjoyment, as a top manager succinctly explained:

> "Beer is about having a good time. We do not make beer to save the world. What we want is to make the best beer, that people can enjoy. That is our ambition. But also to do this with a great deal of respect for our own employees, our environment, supply, et cetera."

The positionings of all four case products are to some degree complex. Several aspects are combined in the positioning, some of which are complicated to communicate. Firms can adopt several practices to deal with these complexities. Therefore, a simple continuum ranging from very low to very high green positioning does not adequately cover all complexities of green positioning. A more elaborate operationalization is warranted, that not only addresses the *degree* of green positioning but also the nature of green positioning practices.

Green Positioning Practices

Different green positioning practices are observed from the cases. This yields information additional to what is conveyed from the degree of positioning. Green positioning practices are described using four aspects of marketing communication:

1. *The use of complex versus simple communication about green issues.* Environmental problems are complex, and customers are more often than not unaware of all complexities. First of all, there are many green issues attached to most prod-

ucts. For instance, green issues relating to SquirtEco include at least biodegradability, VOCs, impact on aquatic life, waste, recyclability, depletion of fossil fuels, animal testing, safety to use around food, and allergies. For SquirtEco, informants showed a preparedness to educate the customer, but also struggled to find ways in which complex issues can be communicated as simple as possible, e.g. using graphic icons. For light green customers other green issues are salient than for dark green customers, which is reflected in communication about the product. In the SquirtEco case, a brand manual is used that identifies three realms for green issues: 'me and my family', 'the environment', and 'society'. For light green consumers, the emphasis is shifted more to the 'me and my family' realm. Furthermore, informants for SquirtEco indicated that they attach great value to honesty in communication, which increases the need to explain complex issues. When complex issues are to be explained in marketing communication, traditional advertising approaches are inappropriate, according to a top manager in the SquirtEco case:

> "We know about traditional communication approaches in marketing that they do not work well for us. I mean advertising campaigns, conventional advertising, television and radio commercials. In the time that an advertising message lasts, you have just about enough time to open your mouth. You hardly have the time to convey only a small message."

For Hardcoat, on the other hand, a different approach was followed. Communication only mentioned VOC level as a green issue, because that aspect was most salient to users because of regulation and personal hazards.

2. *The use of 'pull' and/or 'push' communication channels.* The positioning of the product is supported by using 'pull' communication channels, where the customer takes the initiative for communication, as opposed to 'push' channels, were the supplier takes the initiative for communication. The organizations in the case studies communicate about complex green issues through 'pull' communication channels, like a detailed web site and customer care telephone number for SquirtEco, and a detailed point-of-sales leaflet for Limburgs Land. Even for Mussel Bag, where communication about green issues is minimal, the web site offers more detailed information about green issues than any other 'push' communication.

3. *The degree in which free publicity is used.* A recurring theme in the cases is that green products are often a source of free publicity. This free publicity is sought by the firms. Free publicity is not always sought to enhance the reputation, but as a way to communicate with a limited budget, and possibly to enhance the credibility of the message. Free publicity was the main mode of communication for Limburgs Land and Mussel Bag. Some green products apparently attract media attention and offer an opportunity to generate free publicity.

4. *The use of ecolabels as a supporting positioning instrument.* SquirtEco and Limburgs Land both carry an ecolabel. An ecolabel for Mussel Bag was considered but not applied for, and for Hardcoat it was not considered. Neither SquirtEco nor

Limburgs Land use the ecolabel as a primary positioning tool. It is used as a secondary positioning instrument, as a 'seal of approval'.

Relationship Between Green Targeting and Green Positioning

When looking at the relationship between green targeting and green positioning, the *degree* of green targeting and green positioning offers little information. For SquirtEco, a high degree of green targeting is associated with a high degree of green positioning, whereas for Limburgs Land a high degree of green targeting is associated with a low degree of green positioning (Table 5.8). The data do provide logical argumentation how *practices* for green targeting are associated with green positioning practices.

In the SquirtEco case, where the company made a shift over the years from targeting only dark green consumers to targeting both dark green and light green consumers, green targeting is not so much associated to the *degree* of green positioning, but to the *way* in which the products are positioned as green. Using a graphical model from a brand manual, the 'safeness circle', which illustrates the three realms of green issues that Ecover uses for positioning purposes, a marketing informant for the SquirtEco case explains how positioning is done for the firm's products:

> "[Informant is showing two advertisements, one for light green, one for dark green consumers] We did some consumer research into dark green versus light green consumers. [Pointing at advertisement for dark green consumers:] Here the most important benefit is the general environment. [Pointing at advertisement for light green consumers:] And here it is 'safe for your skin'. […] If you look at our safeness circle, the light green ad refers to what we call 'mine', me and my family. For the dark greens, the ad refers to the 'environment' realm."

For light green consumers, more visually attractive advertising is used, in which complex green issues are made insightful using simple icons, and the emphasis is more on green issues that have a direct impact on the individual. For dark green consumers, the advertisement contains more explanatory text, in which complex information about green issues is provided, and the emphasis is on issues from the 'environment' and 'society' realms from the safeness circle.

Also in the Limburgs Land case, the relationship between green targeting and green positioning can only be understood by considering practices. In the targeting of Limburgs Land, a distribution channel is used that *itself* is already targeted at green consumers and that has achieved a high green positioning of its own. Within that retailing context, Limburgs Land positions itself not as a green product, but rather as an enjoyable product. The eco-label is only used in this context to lend credibility to the product rightfully being included in the assortment of the health trade channel. By targeting through a green distribution channel, the positioning of that channel, combined with credibility to rightfully be present in that channel provided by the ecolabel, the product is perceived as organic. Within the product class of organic products, the company adopts a low green positioning. Here we observe that the green targeting *practice* employed leads to a low *degree* of green positioning, and that the *practice* of using an ecolabel is used as a supporting positioning instrument.

5.6 Innovation Performance

The four case products differ significantly on innovation performance. Within their respective organizations, Mussel Bag was considered a big success, SquirtEco and Limburgs Land a moderate success, and Hardcoat an outright failure. Table 5.9 provides a more detailed account on the findings for the four performance measures identified in the theoretical model. Customer performance, financial performance, and technological performance are all operationalized in the same way as in Chapter 2 and meaningful (see also Griffin and Page 1996). Reputation is a performance measure that was added to innovation performance, based on the results of the theory-building case studies. The results concerning reputation indicate that reputation is meaningful, especially in the context of a showcase product, and that reputation should be specified with respect to stakeholder groups.

Table 5.9: Innovation Performance

Case	Customer Performance	Financial Performance	Technological Performance	Reputation
SquirtEco	High, large increase compared to previous version of product	Moderate, consistent with profitability norms	High, pioneered biosurfactants for use in new cosmetics	Moderate, reaffirms innovativeness with supply chain and research centers
Hardcoat	Low, only significant sales in the U.K.	Very low, low sales and high costs	High, other applications of technology are nascent	Low, laggard image with customers and innovative with competitors
Limburgs Land	Moderate/high, above forecast, good acceptance in organic market	Moderate, consistent with profitability norms	Moderate, other organic products now possibly but unlikely	High, showcase product supporting CSR and innovative image
Mussel bag	Very high, at least eight times more than forecast	High, higher margins than previous and competing products	High, international licensing, (possible) applications for other shellfish/crustaceans	Moderate, innovative image with distributors and competitors

Existence of Showcase Products

The Limburgs Land case confirms the existence of showcase green product innovations. The production volume for the product is very low, due to limited availability of regional organic ingredients. Even for a small brewery like Gulpener, the sales volume of Limburgs Land is not significant. Within the targeted distribution channels, health trade stores, the product's acceptance within the product class of organic foods was positive, though. Sales volumes, albeit low, were above forecast. However, informants typically mentioned reputation as an important reason for developing the product. Therefore, reputation is concluded to be an important performance measure for this product. Limburgs Land is a showcase product, that supports the company's image of a social responsible firm, as explained by a top manager:

> "What is interesting for us as well is that Limburgs Land may be a small-volume product, but it supports the image of Gulpener. People will look twice and say: 'Ah! Another product from Gulpener' Which is positive. Additionally, we have less problems in the current price war. If you consider what is going on in the regular lager market…: a crate of beer costs seven Euros. Every week there's another top brand on discount for seven Euro. Fortunately, Limburgs Land can avoid this. All this means that it's a small product, but very lucrative because of its image."

Another informant called Limburgs Land nothing more than an 'advertising instrument' and explains how it matches and reinforces the company's CSR strategy and image:

> "We make organic beer because we think that it underlines that we can do what we say that we can do. But we do not make it to, let me say, to win the jackpot."

Moreover Limburgs Land is seen as a product that gives the company a more innovative image. The case shows that GPIs exist that serve an important function as reputation enhancer, and that it is therefore meaningful to include this in innovation performance measures.

Reputation With Stakeholder Groups

The results show reputation to be a meaningful construct, but they also reveal that reputation effects may differ between stakeholder groups. Therefore, reputation is operationalized to be the reputation gains that were realized with specific stakeholder groups. The Hardcoat case illustrates this. The product succeeded in realizing positive reputation gains with the stakeholder group competitors, who recognized that Hardcoat was an innovative product that for the first time managed to improve both speed and gloss simultaneously. Hardcoat received an award for this at an automotive industry trade show. The reputation effect with another stakeholder group, customers, was perceived by the informants as negative. Customers were under the impression that novel products in the industry should be based on waterborne technology, in order to reduce the VOC level. Although the VOC level is reduced at least as much by Hardcoat as by waterborne products, it reinforced a negative image of the company among customers. Customers thought that the company was 'betting on the wrong horse', lagging in the development of waterborne technology, and being stuck in solvent borne technology instead.

5.7 Industry Environment

The impact of green issues on the industry is assessed using five components of the industry environment (see Table 5.10). In Chapter 3, four components were identified from the literature that determine 'industry type' (Banerjee et al. 2003), and a fifth component, green market size, was added based on findings from the theory-building cases in Chapter 2. Two industries, food and chemicals, were then selected as high environmental impact industry (HEI) and moderate environmental impact (MEI) industry, respectively. The industry environments will be investigated here in more detail. Three findings emerge. First, the analysis reveals a considerable difference in

Table 5.10: Impact of Green Issues in the Industry Environment

Case	Industry Type[a]	Amount of Pollution[b]	Green Liability Risks	Stringency of Green Regulation for Product Category	Level of Public Concern	Green Market Size for Product Category
SquirtEco	HEI (Chemical)	High contribution relative to economic contribution	Low, little risk	Varies between regions California: high re VOCs Rest of world: low/mod.	Low/moderate, no further widespread public debate since high concerns about phosphates in 1980s	*(Dominant green force)* Varies between countries: - UK: moderate - Rest of world: low/moderate Varies between target markets: - Consumer markets: low/moderate - Business markets: moderate
Hardcoat	HEI (Chemical)	High contribution relative to economic contribution	Moderate, health-related issues	*(Dominant green force)* Varies between trade blocks EU: very high NAFTA: moderate/high Rest of world: low	Moderate, general public awareness of waterborne paints and increasing concern about health issues	Varies between regions: - 'Axis of water': high - Rest of EU: moderate - Rest of world: low
Limburgs Land	MEI (Food)	Moderate contribution relative to economic contribution	Low, little risk	Low/moderate, packaging regulation and process regulation	Low, general public unaware of ecological impacts	*(Dominant green force)* Varies between countries: - Germany: low/moderate - Netherlands: low
Mussel bag	MEI (Food)	Moderate contribution relative to economic contribution	Low, little risk	Low/moderate, packaging regulation and process regulation	*(Dominant green force)* Moderate, concerns about impact of cockle and mussel (/seed) fishing on Wadden Zee	Very low, no green market niche for mussels

[a] Selection variable (see Chapter 4), HEI = High Environmental Impact, MEI = Moderate Environmental Impact
[b] Source: archival data for the years 2001/2002 (RIVM-MNP 2003a)

impact of green issues on the industry between the two HEI case studies. Second, the findings show that the environmental force that predominantly determines which green issues are important in the industry differs between cases. Third, significant differences within the industry environments are observed, e.g. between countries.

Assessment of Selection Variable 'Industry Type' from the Case Data

In Chapter 4, two industries were selected: the chemical industry as a HEI industry, and the food industry as a MEI industry. The selection was based on archival data on both stringency of green regulation (measured by pollution abatement and control expenditures) as well as the size of green market demand in the industry (measured by various market characteristics). To verify the assessment from Chapter 4 and to improve our understanding of the role of market environment in GPI strategy, components of industry environment are analyzed from the case data. Table 5.10 shows the main findings on five components: amount of pollution, green liability risks, stringency of green regulations, level of public concern (see also Banerjee et al. 2003), and green market size. Both stringency of green regulation and green market size can now be measured in more detail, i.e. on a level that is relevant to the product category. All other assessments are made on an industry level.

The amount of pollution in the industry cannot be operationalized from the interview data, because informants are not knowledgeable enough to compare the environmental impact of their industry to another. Instead, archival data were used. Amount of pollution was determined using Dutch environmental census data about the relative contribution of industries to four major environmental themes (greenhouse effect, acidification, eutrophication, and waste generation), compared to their relative contribution in economic value (RIVM-MNP 2003a). The data show, for instance, that the chemical industry is responsible for 12.8 % of the Dutch contribution to the greenhouse effect, whereas it only represents 2.3 % of the economic value generated in the country. The comparison of these two percentages yields the relative contribution, which was calculated for each industry. The chemical industry's relative contribution to greenhouse effect, acidification and eutrophication is much higher than the food industry's, whereas the food industry has a somewhat higher relative contribution to waste generation. The data on amount of pollution lend strong support for the classification of the chemical industry as a high environmental impact industry and the food industry as a moderate environmental impact industry.

Considering the other green components of industry environment (green liability risks, stringency of green regulation, level of public concern, and green market size) a somewhat more mixed picture emerges. The role of green issues in the industry environment is strongest in the Hardcoat case. The role of green issues in the industry environment for SquirtEco, however, is clearly not as strong as in the other case study from the chemical industry. On the other hand, green issues generally play an even smaller role in the environmental contexts for Limburgs Land and Mussel Bag than they do for SquirtEco. Nevertheless, the high impact of green issues in the chemical industry in general does not entirely translate in the specific context for the case product SquirtEco.

Dominant Green Forces Differ Between Cases

The results show that green issues enter the industry environment through different components. For each case, a dominant green force was identified. A dominant green force is a component of the industry environment that is shaping or has potential to shape the green issues in the industry environment. Dominance of a force is independent of the *level* of the component, but represents the perceived *weight* of the component in the industry. The dominant green force is the component that is most important to monitor concerning green issues, in order for the company to achieve a strategic fit between organization and environment concerning green issues. The dominant green force is what principally determines the green issues in an industry, and thus it has an impact on other components of industry environment.

Hardcoat provides a clear example of a dominant green force. In this case, stringency of green regulation is the dominant green force. The longitudinal data on this case reveal that in 1998, regulation was practically the only reason why green issues had an impact on the industry. Six years later, stringency of green regulation has completely changed the industry and has led to a convergence in technology, being waterborne technology, at least for the European market. A marketing informant looks back on the announcement of new Dutch VOC regulation in 1998, and explains the impact on the industry in Europe:

> "That new regulation mandated waterborne base coats, i.e. Aquacoat. And that regulation became the example for all countries in Europe, and that has been taken very far. 2007 was mentioned as the date for new regulation, when everybody has to have switched to 'water'. That legislation has been confirmed in January this year [2004]. And it will move beyond a 'buyers law', it will become a 'sellers law'. Rather than having to inspect ten thousand users, they now have to inspect only ten paint suppliers. So starting January 1, 2007, it's water, water, and more water."

Because of the higher stringency of green regulation in some parts of the world, the playing field in the industry has already changed. In the mid 1990s, there were seven large companies marketing car refinishes in Europe. In 2004, there were only four left. This was at least in part caused by green regulation. Many manufacturers, including a lot of small ones, were not able to develop an adequate response to the green regulation. Green regulation has been a factor that helped reshape the entire car refinishes industry. The green dominant force for Hardcoat has an impact on other components of demand, as well. By increasingly stringent regulation, and announced regulation, the small niche of users who demanded waterborne technology grew rapidly. In some markets, waterborne technology is becoming the dominant technology.

For Hardcoat, the dominant green force is regulatory push. In two other cases, SquirtEco and Limburgs Land, the dominant green force is demand pull. This is not to suggest that the entire market is moving toward green products. Rather, it acknowledges that the green issues that play a role in the industry are determined by the demands of a green segment or niche. Green issues are predominantly introduced in the industry environment by small groups of green consumers, rather than by regulation or another environment component.

In the Mussel Bag case, the dominant green force is neither demand pull nor regulatory push. Green issues that impact the environment are predominantly rooted in general public concern. Environmental SIGs have highlighted the potential damage to the ecosystem of the Wadden Zee by mussel and mussel seed fishing, and particularly by mechanical cockle fishing. Like in the Hardcoat case, the dominant green force harvests the potential to structurally change the industry. In 2004, some shellfish processing companies closed down their shellfish conserves operations, allegedly because of an impending ban on mechanical cockle fishing in the Wadden Zee. Although public concern is the most important force introducing green issues into the industry's environment, the impact of public concern is limited to certain business processes.

Within-Case Differences in Impact of Green Issues

In two components of the industry environment, stringency and market size, considerable differences are observed *within* the cases. Differences are observed between regions, countries, and trade blocks, as well as between consumer versus business markets. These differences can be particularly important for understanding and testing of moderating effects within a case, and therefore deserve specific attention.

Within-case differences are the most extreme in the Hardcoat case. VOC regulations divide the world roughly into three regions: (1) the European Union, with more and more stringent regulation and markets developing towards waterborne products as a consequence, (2) North America, with less stringent regulation and markets developing mainly towards low-VOC solvent-borne products, and (3) the rest of the world with hardly any VOC regulation. This is a rough classification used by management in the Hardcoat case, and generally throughout the industry (e.g., Drexler and Sell 2002). Although legislation within each region is similar, differences can also be observed within each region. For instance, UK regulation, until the EU regulation comes into force, only limits the average VOC of both base coat and clear coat, whereas Dutch regulation has maximum VOC levels for both base coat and clear coat. Also, some areas of 'rest of world' have more stringent regulation than others. Moreover, there is other relevant regulation than VOC regulation, for instance on hazardous materials (toxicity), that differs between trade blocks and countries. Reality is even more differentiated than the picture painted in Table 5.10.

As green regulation is the dominant green force, its impact is reflected in green market size. Due to impending or present regulation, some parts of the EU have rapidly developed markets for waterborne technology, as an R&D informant for Hardcoat describes:

> "There are a few countries where waterborne just carries a very positive image. I think The Netherlands, Germany, Scandinavia… it's really kind of an 'axis of water' right through Europe. In France or Spain you shouldn't mention it, but Northern Italy, Switzerland, Germany, Sweden, The Netherlands, Belgium are all countries where waterborne products simply carry a very positive image. Which doesn't mean that every customer over there uses waterborne products."

Table 5.11: Summary Results of the Theory-Testing Cases

Case	Impact of Green Issues in Industry Environment	Antecedents		
		Top Management Commitment to Green Issues	Stakeholder Orientation	
			Scope	Scrutiny
SquirtEco (A)	Moderate (Dominant: green market size)	High	Competitors Customers Research centers Supply chain members SIGs	Low Low High High[a] High
Hardcoat (B)	High (Dominant: stringency of green regulation)	Moderate	Customers Regulators Competitors	Low Low Low
Limburgs Land (C)	Low/moderate (Dominant: green market size)	High	Competitors Supply chain members Customers	Low High[b] Low
Mussel bag (D)	Low/moderate (Dominant: public concern)	Moderate	Supply chain members Competitors Customers Other firms	Low High Low High

[a] High scrutiny applies only to health trade retailers, low scrutiny otherwise.
[b] High scrutiny applies only to suppliers, low scrutiny otherwise.

Table 5.11: Summary Results of the Theory-Testing Cases (continued)

Case[c]	Green Product Innovation Strategy			Innovation Performance
	Process Characteristics	**Product Characteristics**	**Introduction Characteristics**	
(A)	High green coordination High green priority	Green Highly new, but not to cust. Low relative advantage High product cost	High/very high green targeting High green positioning	High customer Moderate financial High technological Moderate reputation
(B)	Moderate green coordination Moderate green priority	Green Highly new Low relative advantage High product cost	Low green targeting Low green positioning	Low customer Very low financial High technological Low reputation
(C)	Low green coordination High green priority	Green Not new, but moderate to firm Moderate relative advantage High product cost	High green targeting Low/moderate green positioning	Mod./high customer Moderate financial Moderate technol. High reputation
(D)	Moderate green coordination Low green priority	Green (Highly) new, but mod. to cust. Moderate relative advantage Low product cost	Low green targeting Low green positioning	Very high customer High financial High technological Moderate reputation

[c] Letters refer to cases, as indicated in the left part of the table.

Overall, the analysis of the impact of green issues in the industry environment reveals a significantly more detailed and complex picture than the classification of moderate versus high environmental impact proposed by Banerjee et al. (2003) and used in Chapter 4 to select industries for the case studies.

5.8 Causal Relationship between Antecedents and GPI Strategy

The previous chapters of this chapter concentrated on understanding and assessing the constructs in the study. The remainder of the chapter is devoted to testing the causal relationships

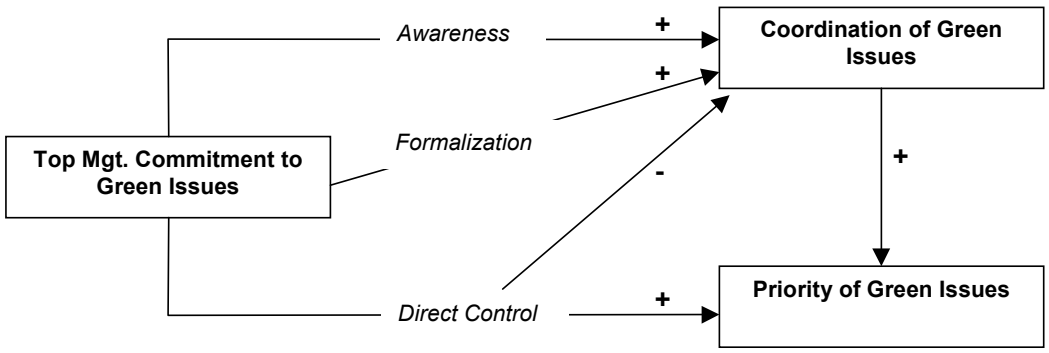
between the constructs, as they are specified in Chapter 3. This section will deal with the relationships between antecedents and GPI strategy (propositions 1, 2, 3, and 5). The other propositions will be tested in the next two sections. As outlined in Chapter 4, testing is achieved by first studying the patterns of association (to check for associative variation), followed by an investigation whether the case data provide an underlying logic for the relationship (to rule out non-spurious association and assess temporal sequentiality). Associative patterns can be assessed from the summary results of the descriptive analysis in Table 5.11. Underlying logic is primarily obtained from the interview fragments in which the informant was invited to use forward an backward logic to elaborate on possible relationships (see Chapter 4).

Top Management Commitment and Process Characteristics

The pattern of association in Table 5.11 reveals a general positive association between top management commitment to green issues and the process characteristics. Higher levels of commitment are associated with higher levels of coordination and priority of green issues. Analysis of the causal codes reveals three distinct underlying logics that explain how commitment translates into the product development process: awareness, formalization, and direct control (see Figure 5.1). The general pattern is explained by awareness and formalization. The exception to this general pattern is explained by direct control. Each of the three logics is explained below. The fourth association in the figure, between coordination and priority of green issues, has already been established in the descriptive analysis of process characteristics (Section 5.3).

1. *Awareness.* The findings on top management commitment to green issues (see Section 5.2) indicated that spillover of high top management commitment to lower echelons in the organization occurred through a diffusion process. Further analysis revealed that informants in all four cases describe how the top management influences awareness of green issues throughout the organization. Informants for Limburgs Land report how the ambition statement that was laid down by the top management received widespread support in the organization and led to an increased awareness of green issues in new product development. In the SquirtEco case, high top management commitment has completely diffused throughout the organization, securing high awareness of green issues in all business functions. For Mussel Bag, the moderate commitment to green issues enter-

Figure 5.1: Commitment – Process (Association & Logic)



tained by the top management, has led to all employees at least being aware of the importance of natural resource preservation to the industry, and hence taking it into account when taking business decisions. In the Hardcoat case, informants report of a 'product stewardship' program, as well as workshops, that put green issues on the product development agenda. Product stewardship is a code of practice that is part of the industry wide Responsible Care program, which seeks to improve the environmental and safety performance of chemical firms (King and Lenox 2000). Product stewardship is being propagated by top management and stimulates employees to take a critical look at possible green issues in product development, as the following quote illustrates:

> "Product stewardship assists into getting sustainability issues into new product development. You start to look more critical at raw materials, and not just the raw materials and their role in the product, but in the entire life chain. It is not hard to imagine that products that are developed now [after introduction of the product stewardship program, PD] are being screened more critically in advance than they were in the past. That is really a difference, for which to a large part we have product stewardship to thank for. (Interviewer:) The product development teams now get this extra element to take into account in their activities? (Informant:) Yes."

2. *Formalization.* Results about green coordination mechanisms revealed that the mechanisms differ primarily in the degree of formalization (see Section 5.3). Further analysis shows that formalization is used by the top management to ensure that green issues are integrated in the new product development process. The role of formalization in translating top management commitment to green issues into the product development process is best illustrated by SquirtEco. Written guidelines, norm statements, procedural forms, and systems are all in place to ensure that a wide array of green issues is taken into consideration in each product development project (see Table 5.5). Top management designs all these formal coordination mechanisms, and is also involved in making amendments.

3. *Direct Control.* Awareness and formalization explain the positive association observed in three of the four cases: SquirtEco, Hardcoat, and Mussel Bag. The observed pattern in Limburgs Land is anomalous, in the sense that it combines high top management commitment with low coordination of green issues. In this case,

top management exerted direct control over the inclusion of green issues in the product development process. The company's CEO decided that, to complement the firm's CSR strategy, an organic product was essential. For Limburgs Land, the CEO dictated the high priority for green issues by setting the objective that the product would have to qualify for an EKO label. In doing so, very little coordination of green issues took place. The mechanism in which green commitment of top management influenced the process is very straightforward in this case, because the CEO took place in the project team as environmental champion:

> "(Interviewer:) Who was the person in the project that stressed green issues? (Informant:) [Name of CEO], our CEO. But more from a perspective: I want to have that beer, we should have it in our assortment. The quality issues and taste he left entirely to [name of brewmaster]. (Interviewer:) The green issues were the pet issue of the CEO? (Informant:) Yes, yes, yes. (Interviewer:) How did he influence that? (Informant:) Yes, he said 'before this date we need to have an organic beer'. Including a clear time limit as if to signal: 'guys, we really got to have this thing.' I think it was also an idea of [name former CEO]."

Thus, if top management influences the priority of green issues in the development process through direct control, the need for further coordination of green issues is eliminated. Therefore, in the 'direct control' logic, top management commitment has a positive impact on priority of green issues, but a negative impact on coordination of green issues.

In some cases, multiple logics apply. In the Limburgs Land case, two logics are identified. The 'direct control' logic is dominant over the 'awareness' logic, thus explaining the anomalous association between commitment and coordination. In the SquirtEco case, all three logics identified in Figure 5.1 are observed. Here, top management uses all three different methods to influence the product development process, creating a certain redundancy in its approach. Direct control in this case is a redundant method in which the top management can exert influence on the product development process. The same holds to some degree for formalization. The stakeholder management system is a formal coordination mechanism that is mostly redundant in new product development processes, only to be used when dilemmas present themselves. The following quote from SquirtEco identifies 'awareness' as the dominant logic, while acknowledging the existence of formalization and direct control:

> "Very often we interpret 'hygiene' as 'ecological hygiene'. This is al laid down in paper, and for the ISO 140001 certification this is all audited. Those auditors check whether we really do what we put on paper. Also [name concept manager] is a member of the management team, the top management. If decisions have to be taken there, he has a say in that, too. There are of course all sorts of meetings. Apart from the things that have been formalized, like the before mentioned, there is also and foremost the atmosphere and shared goals that prevail in the firm."

The previous quote identifies awareness throughout the whole organization as the primary logic how top management commitment is translated into the product development process. This explains why, in the SquirtEco case, the resulting association between top management commitment to green issues and coordination of green issues is positive, rather than negative. The 'awareness' logic is dominant in this case,

with the 'formalization' is secondary, and 'direct control' redundant. Direct control is only used in case of dilemmas, when the product development team has difficulties resolving a trade-off. This is illustrated in the following quote, where the informant reports on a product development project for a dishwashing liquid in which a trade-off between a green and a non-green issue caused disagreement in the team. The dishwashing liquid contained an ingredient that caused the liquid to turn into an unappealing brown color if kept in storage for a few months. Some in the team, however, did not want to counter this effect with colorants, for ecological reasons. The management team resolved the dilemma, as described in this quote from a marketing informant who was in favor of adding a colorant:

> "We could have applied a colorant. I didn't win the battle in that case. The management team decided: we are not going to add a colorant. We are going to explain to our customers what is the case, every time we receive a complaint about the color. It's a trade-off every time. I, personally, would add a colorant the first thing tomorrow morning, but within the firm the arguments are different. They said: we shouldn't do it."

Above results show that top management commitment to green issues has a strong relationship with both coordination of green issues, as well as priority to green issues. The associative patterns and logical argumentation reveal that top management commitment to green issues increases the coordination of green issues in the GPI development process, unless top management primarily uses direct control to translate top management commitment into the GPI development process. The results also reveal that top management commitment to green issues increases the priority of green issues in the GPI development process.

Stakeholder Orientation and Process Characteristics

The main result about the relationship between stakeholder orientation and process characteristics is that components of stakeholder orientation relating to non-market stakeholders leads to increased coordination of green issues and increased priority of green issues, whereas components of stakeholder orientation relating to market stakeholders have the opposite effect (see Figure 5.2). Furthermore, stakeholder orientation has a different impact on coordination of green issues than it has on priority of green issues. The results provide mostly logical support for relationships between stakeholder orientation and priority of green issues, rather than coordination of green issues. Only scope of generic stakeholder orientation (see Section 5.2) has an effect on coordination of green issues, whereas various components of project-specific stakeholder orientation are found to have an effect on priority of green issues. Five underlying logics explain these relationships, as described below.

1. *Non-market stakeholder information.* Information collected by having a wide scope in generic stakeholder orientation includes information from non-market stakeholders. Non-market stakeholders put more emphasis on green issues, and therefore more green issues are incorporated in the product development process. The latter increases coordination of green issues. This relationship is positively moderated by stringency of green regulations. Under very stringent green regulation, such as observed in the Hardcoat case, green issues identified by monitoring

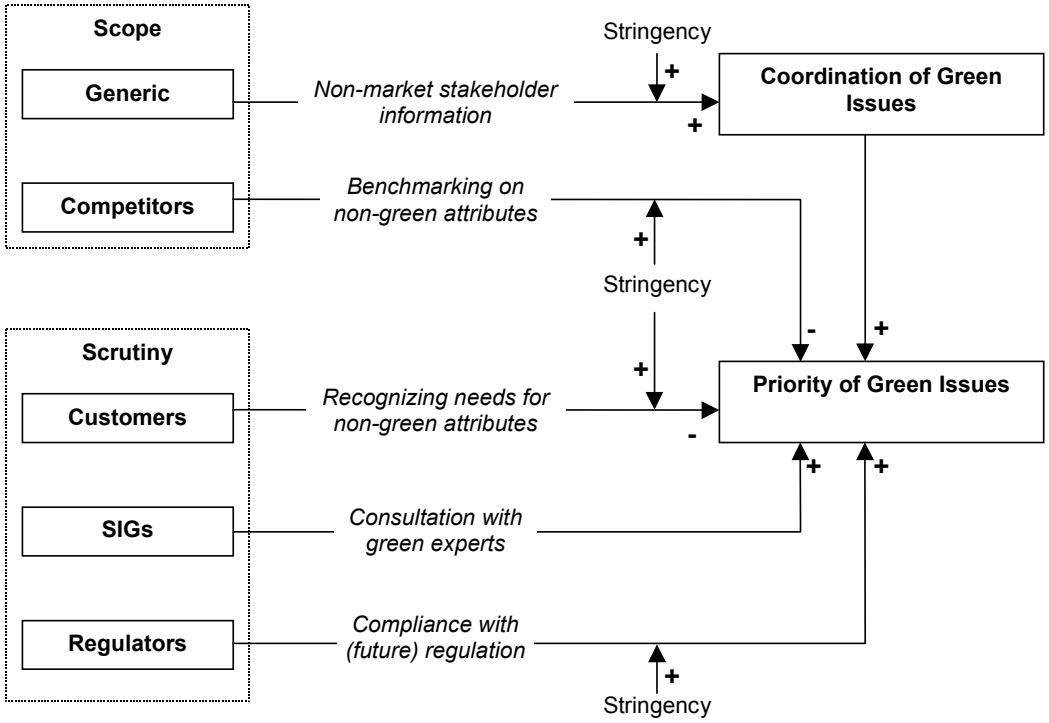
non-market stakeholders are further integrated in the product development process, thus leading to more coordination of green issues.

2. *Benchmarking on non-green attributes.* In several cases, organizations used information about competing products as benchmarks during new product development. The benchmarks that are used pertain invariably to non-green product attributes, such as functional performance and convenience. Green product attributes of competing products are not used as benchmarks. As a consequence, product development projects where competitors are within the scope of stakeholder orientation devote more effort to improving on or at least equaling non-green attributes of competing products. For Limburgs Land for instance, all competing organic beers were studied on appearance and taste, and the product development was consequently aimed at developing an organic beer with better appearance and taste. On other attributes, the product was deliberately developed to resemble the existing beers, as the following quote of an R&D informant exemplifies:

> "We knew for sure that we would have to develop a lager-type beer. (Interviewer:) That was somewhat inspired by the market? (Informant:) All ecological beers are along the same lines. We wanted to be part of that line-up. We did not want to introduce an brown ale type or similar. Look, it's quite logical, because even with a 'special beers' brewery like ours, still eighty per cent of what we brew is lager, so if you want to be in that niche 'ecological beer', you shouldn't take a product that's only five per cent of the market and label it ecological. Because then you know that you'll end up making less than five per cent of the total. We wanted to hit the bull's eye.

Similarly, for SquirtEco, the project was aimed at developing a green all-purpose cleaner that equaled competing main stream products on convenience and cleansing power. In both cases, priority for green issues was high, because the negative effect of benchmarking on non-green attributes was compensated by positive effects of top management green commitment and coordination of green issues. For Hardcoat, informants report about a product development project where competitors were more within the scope of stakeholder orientation, which led to a low green priority. Because trade-offs between green and non-green issues appear frequently (as observed in Section 5.4), an increased priority for non-green issues often leads to a decreased priority for green issues. Mussel Bag is an anomaly in this sense, because it is a 'free-lunch' product, where the trade-off between green and non-green issues is completely absent. In this case, applying the benchmarking logic identified here, no longer holds in explaining the level of priority of green issues. 'Free lunch' products such as Mussel Bag, however, are likely to be more of an exception than the rule (see Section 5.4). Apart from the negative direct effect, a logic for a moderating effect is also observed. Informants for Hardcoat, reported how a very stringent industry environment leads to a relatively high priority for green issues, even when competing products are benchmarked. They reported about projects where it was so complex to comply to regulation, that non-green issues received low priority.

Figure 5.2: Stakeholder Orientation – Process (Association & Logic)



3. *Recognizing needs for non-green attributes*. In a similar vein to the previous logic, increased scrutiny in stakeholder orientation towards customers leads to lower priority of green issues. In this logic, high scrutiny leads to better identification of, especially latent, customer needs. As these needs mostly apply to non-green product attributes, the recognition of these needs, leads, ceteris paribus, to a lower priority being given to green issues. Informants for Hardcoat provide the strongest support for this logic. In a project, undertaken after Hardcoat, scrutiny in stakeholder orientation towards customers was higher than for Hardcoat, which resulted in a lower priority for green issues. Like in the previous logic, this negative effect on priority for green issues is moderated by stringency of green regulations. Stringent green regulation ensures that green issues do receive a higher priority than can be expected from the direct effect.

4. *Consultation with green experts*. If scrutiny in stakeholder orientation towards SIGs is high, priority for green issues increases. This logic is found in the SquirtEco case. Informants report about product development projects in which SIGs were used as a source of expertise on green issues. Consultation with green experts changed the assessment of some green issues, leading to a higher priority being attached to these issues.

5. *Compliance with (future) green regulation.* As scrutiny of the information generation about regulators increases, product development teams become aware of impending regulation or the direction in which regulation is likely to develop. In order to develop products that comply with future regulation, regulatory

requirements will be anticipated in the development process, thus enhancing the priority attached to green issues. This relationship is enforced in an industry environment subject to stringent green regulation. Support for this logic is mainly provided by the data for Hardcoat, as stringency of green regulation is the dominant green force in this industry (Section 5.7). Additional support for this relationship is found in the SquirtEco case by analyzing the effect of different levels of stringency of green regulation. Californian VOC regulation in this case poses additional requirements to the product, because the plant-based alcohol in SquirtEco may not be used as an ingredient. This further increases the priority being given to green issues.

Above logics indicate differential effects of market versus non-market stakeholder orientation: a positive effect for non-market stakeholder orientation, and a negative effect for market stakeholder orientation. Scope in generic stakeholder orientation increases coordination of green issues. The effects of project-specific stakeholder orientation on process characteristics are mostly on priority of green issues. Scope and scrutiny of non-market stakeholder orientation increase priority of green issues, whereas scope and scrutiny of market stakeholder orientation decreases priority of green issues. Furthermore, the results show a moderating effect for stringency of green regulation. In general, the positive effects of scope and scrutiny of stakeholder orientation on innovation process characteristics are greater in industries with stringent green regulation, whereas the negative effects are dampened by stringent green regulation.

Stakeholder Orientation and Product Characteristics

Results about the relationship between stakeholder orientation and product characteristics show a difference in impact for market stakeholder orientation versus non-market stakeholder orientation. Similar to the findings for the relationship between stakeholder orientation and priority of green issues, a market stakeholder orientation leads to lower greenness, whereas non-market stakeholder orientation leads to higher greenness. Figure 5.3 shows the results for the relationship, and reveals six underlying logics.

1. *Manifest needs for non-green attributes.* Supply chain members, specifically distributors, expose manifest needs for non-green attributes, rather than green. Informants from all three cases in which retailers are used as a distribution channel report great difficulties in getting green products listed by retailers. Retailers focus on other, non-green attributes, when selecting products. If retailers receive a lot of attention in the stakeholder orientation's scope, greenness of product innovations will therefore be lower. This negative relationship is positively moderated, however, by green market size. This is observed from the Mussel Bag case. In this case, the retail market is generally more sensitive to green issues than the wholesale market. When developing products for the retail market, green issues are more likely to be translated into the product than for the wholesale market. The moderating effect is also observed in the Limburgs Land case, where the company learned before the start of the project that supermarkets are very reluctant to carry the product and that the health trade channel would be willing to list

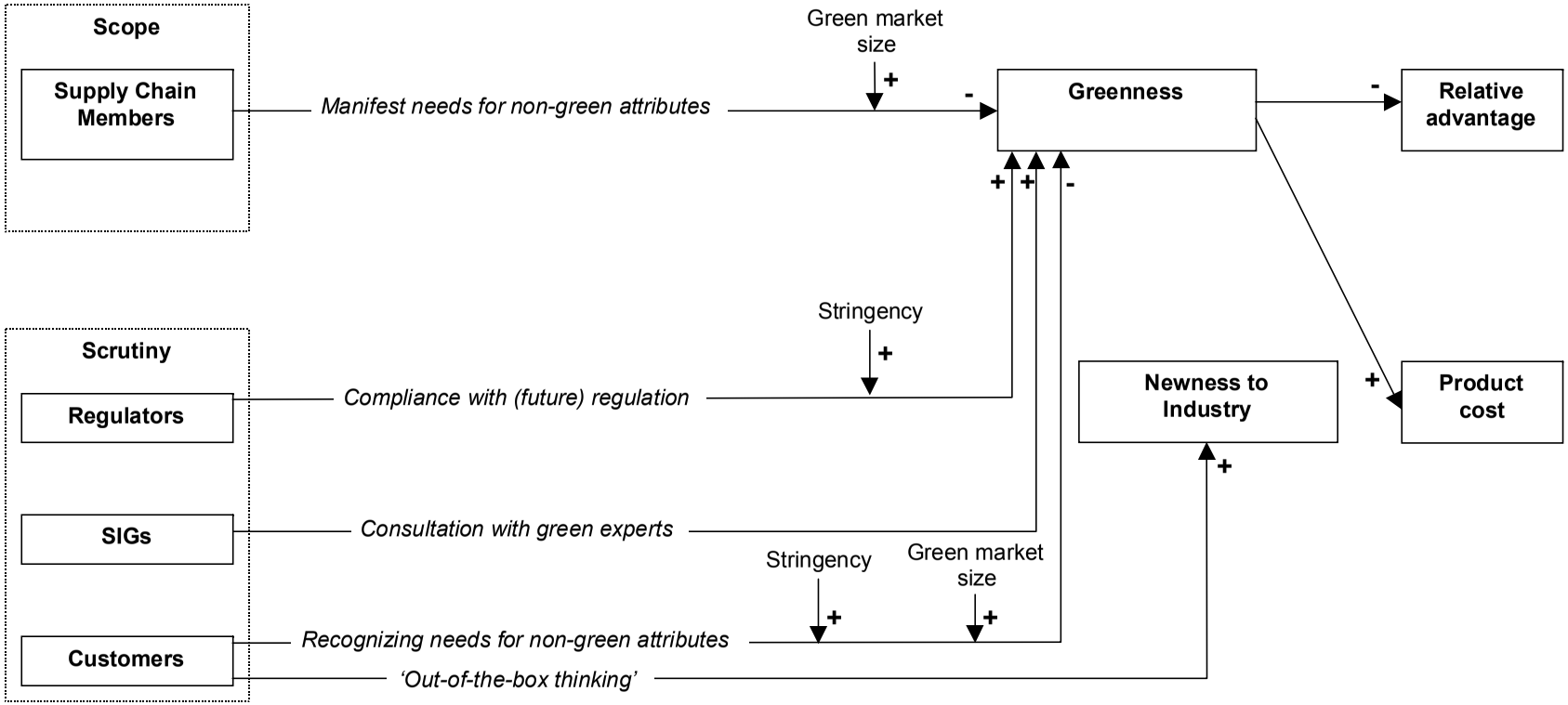
the product but only represented very small volumes in beer sales. Ceteris paribus, this information would have a led to a less green product, had it not been for the realization that the size of the organic beer market in supermarkets was likely to grow. A small proportion of supermarkets was likely to list it, because they would use the product to achieve a quotum of organic products in their stores as had been voluntarily agreed to by Dutch supermarkets in a covenant. Although the effect of the covenant was likely to apply to a very small proportion of supermarkets, it created just enough market size to warrant the development of an organic beer.

2. *Compliance with (future) regulation.* Scrutiny in regulator orientation leads to greener products being developed. The more a company is able to predict green regulation, the greener the products that are developed, given that green regulation is increasingly stringent. Under conditions of stringent regulation, the effect of scrutiny in regulator orientation on greenness is stronger, and weaker under conditions of lenient regulation. A prime example of the latter is offered by the Hardcoat case. A product based on Hardcoat, but with higher VOC level, and therefore less green, was introduced in a less stringent market. A product with higher VOC level was desirable because it would yield a product with better application qualities. A marketing informant illustrates how less stringent regulation permits this:

> "It is not the same product [as Hardcoat]. This is because legislation in the United States is different. In Europe, everything that is not water, is a 'solvent'. In the U.S., there's water, solvents, and 'exempt solvents'. And those 'exempt solvents' are really solvents, but do not count as emission. Which is a complicated story; it has to do with ozone reactivity of the solvents. There's a group of solvents of which the Americans say: there's no ozone reactivity. So those are permitted. (Interviewer:) This is Californian law? (Informant:) No. The whole of the United States. These exempt solvents are applicable in all of the United States, but are most relevant in California, because the thresholds for solvents are a lot lower there. So there you are much more forced to use the 'exempt solvent' concept to reach the desired VOC level.

However, stringent green regulation can also have perverse effects, which are observed several times in the cases. A perverse effect is the situation in which green regulation leads to less green products being developed. Informants for SquirtEco quote VOC regulation in California as an example. For SquirtEco, stringent VOC regulation in California prohibits the product in that region because of its high alcohol content (alcohol is a VOC). Therefore, the product was adapted for the Californian market with some of the non-synthetic alcohol replaced by petrochemical preservatives. In doing so, the ozone reactivity is reduced, but only with a substantial deterioration in other green issues. In this case, stringent green regulation contributed to an overall less green product compared to the SquirtEco sold in the rest of the world, in the opinion of the informants. Informants for SquirtEco quote other public policy interventions that forced the company to make its products *less* green, rather than greener. The positive moderating effect thus only holds for well-crafted green regulation.

Figure 5.3: Stakeholder Orientation - Product Characteristics (Association & Logic)



3. *Consultation with green experts.* In a similar vein as scrutiny in SIG orientation has an impact on priority of green issues, it also has an impact on greenness. The underlying logic is the same. SIGs are used as sources of green expertise, and the information gained from the green experts of the SIGs contributes to greener products being developed. This is not to imply, however, that all input of SIG experts is incorporated into a new product. The SquirtEco case shows that environmental concerns uttered by SIG experts are weighed against other issues, and sometimes a compromise emerges. An illustrative example is the issue of animal testing. SIG experts want the firm to go further on this issue, but the firm resists because it would hamper innovation. A compromise is the result, as is witnessed by the following fragment from an interview with a marketing informant for SquirtEco:

> "We recently consulted with Gaia, which is a Belgian animal rights organization, about animal testing, for information exchange and an exchange of opinions. (Interviewer:) Does this translate into new product development? (Informant:) Yes. I can give you an example. We are now having a discussion with Gaia, and also with a British animal rights organization, about animal testing. These organizations are opposing animal testing, and Ecover fully agrees with them. For the raw materials we use, we have had our suppliers sign an agreement. They didn't all sign. That there's no animal testing. The only issue is that animal rights organizations ask us to use a fixed cut-off date. But new ingredients are sometimes required by law to be tested on animals."

   In general, consultation with green experts as described above is a form of high scrutiny information generation that leads to new insights in how to achieve greening of products.

4. *Recognizing needs for non-green attributes.* The higher the scrutiny in customer orientation, the likelier that latent consumer needs for non-green attributes are uncovered. This logic is similar to the one found for the relationship with priority of green issues. Informants for SquirtEco report how the firm over the years has gotten more insight in convenience needs of customers. This increased insight led to products that would not have been developed in the past, because they were considered to be 'inherently non-green', like SquirtEco. Additional support for the logic is gained from the Hardcoat case, where an informant explains how low scrutiny in customer orientation can lead to greener products that really do not satisfy a customer need, and higher scrutiny can prevent this:

> "Someone [of the marketing staff] joins a technical consultant to visit bodyshops. 'A gentleman from the central organization in Holland' pays a visit to a German customer. The overalls is tidied, and he is very honored to be asked his opinion to where it is all going to. So he says: 'we think that waterborne products will become more important'. What does that mean? He has read about it, in the Lackiererblatt, a trade magazine for bodyshops. In which he reads: water, water, water, and water. And so he thinks… he's afraid to run behind and he wants to keep up. How do you deal with that? You can hear whether it's a fad or whether there's really a serious need growing. I speak of a serious need when somebody has a decently thought-over response to the two questions: 'why' and 'how'."

This negative direct relationship is positively moderated by both stringency of green regulation and green market size, as demonstrated by the Hardcoat case. Green market size and stringency appear to be working in sync, and are to some degree related. In the 'axis of water' in Western Europe (Section 5.7) future green regulation has stimulated a green market to develop. In these markets, high scrutiny in customer orientation is more likely to lead to green products than in other markets.

5. *'Out-of-the box thinking'*. High scrutiny in customer orientation leads to high newness, particularly newness to the industry. High scrutiny leads to the identification of latent customer needs rather than easy-to-observe, manifest, needs. Identification of latent customer needs can lead to product concepts that are entirely new to the industry. Thus, if high scrutiny in customer orientation is met with creativity, a new-to-the-industry product is the result. Informants for Hardcoat provide an remarkable example of what can happen if manifest needs are not taken for granted. Within the organization, product developers had always assumed that customers wanted durable, high-gloss car refinish in many color variations. When marketers started to think 'out-of-the-box', and turned these assumptions upside down, they uncovered a latent need. The company developed a temporary paint that can be peeled off after use. This product served a latent need of temporary embellishment of cars, for instance during a major sports event. Similarly, the Mussel Bag case shows elements of 'out-of-the-box' thinking in realizing a breakthrough for conditioned mussel packaging. Although a relationship of newness with greenness could not be established from the case data, insight in the determinants of newness of GPIs is relevant because it helps to understand the antecedents of green 'breakthrough' products, such as Mussel Bag.

The association between stakeholder orientation and greenness exhibits a pattern similar to the association between stakeholder orientation and priority of green issues: orientation towards market stakeholder groups has a negative impact on 'greening' and orientation towards non-market stakeholder groups has a positive impact. Also, many aspects of the underlying logic are similar. This brings up the question whether both relationships exist in parallel, or that the stakeholder orientation – greenness relationship is mediated by priority of green issues. Although a direct relationship between orientation towards market stakeholder groups and product characteristics has often been proposed and found in research (e.g., Gatignon and Xuereb 1997; Han et al. 1998; Lukas and Ferrell 2000), it is likely that this relationship is in fact mediated by process characteristics. The case data cannot give a definitive answer to this question, but the fact that many of the underlying logics for both relationships are similar suggests that we are dealing with a single mediated relationship.

Stakeholder Orientation and Introduction Characteristics

The results for the relationship between stakeholder orientation and introduction characteristics are inconclusive. The case database contains only eight segments with relevant information, making triangulation more difficult. Furthermore, no unequivocal logics emerge from the data. Therefore, faced with this lack of results, we must assume that no relationship exists in order to reduce type-I error.

The lack of results does not necessarily imply that no relationship exists. In one case, Mussel Bag, green targeting or positioning had never been tried in the industry, which made it difficult for informants to elaborate on possible causal relationships between stakeholder orientation and introduction characteristics. In the Hardcoat case, introduction strategies were determined by product characteristics, again making it difficult for informant to elaborate on possible causal relationships. From the SquirtEco and Limburgs Land cases, results emerged that cannot be triangulated. Although triangulation of the findings for SquirtEco and Limburgs Land is not possible, they do yield two tentative results. Both tentative results link market stakeholder orientation to green positioning practices, rather than the degree of green positioning.

The first tentative result, emerging from the SquirtEco case, is that scrutiny in customer orientation might be linked to the green positioning practice of communicating a complex green message through simple communication (as identified in the descriptive analysis in Section 5.5). As scrutiny in customer orientation had increased four years ago, the more the insight grew that attributes that are salient to the customers, and not necessarily green attributes, should be used for positioning the product. An informant elaborates about the consequences of the improved customer orientation, while comparing the situation of the present with four years ago:

> "Nowadays we acknowledge the consumer and his or her needs more. This is also visible in our communication. Everything from four or more years ago, all USPs that were on the packaging and that we used in advertising, were *these* [points at the 'environmental' and 'society' realms in a graphical model]. What we started four years ago, is to not only communicate those, but also *these* [points at the 'me and my family' realm in a graphical model]. (Interviewer:) You mean the more personal benefits rather than only green benefits? (Informant:) People are first and foremost driven by 'what's in it for me'-kind-of-motives. And they do find the other story important, but it is in the background. (Interviewer:) So you started to position your self as less green? (Informant:) No. It's more like the one has been added to the other. Product positioning has become more balanced. Both *this* and *this*. Voilà!"

The above fragment shows that the informant is reluctant to label the changed positioning as less green. It appears to be more of a combination of green and non-green positioning attributes, as observed in the descriptive analysis of introduction characteristics. This implies that higher scrutiny in customer orientation leads to a more balanced positioning.

The second tentative result, emerging from the Limburgs Land case, is that the presence of competitors within the scope of stakeholder orientation might be linked to the use of ecolabels as supporting positioning instrument only in an otherwise non-green positioning. Limburgs Land is positioned on hedonic features within the organic product class. The ecolabel is only used to lend credibility to the claimed membership of the organic product class. The ecolabel is a secondary positioning instrument. Desk research and store checks of the organic beer market revealed that competing products were primarily positioned as organic. This prompted a different positioning for Limburgs Land, as witnessed by the following fragment:

> "We established, among others, that what was there at the time, was primarily 'ecological'. This did not correspond with our principles. But on top of that, the products just did not taste good. It was too far removed from real lager beer. (Interviewer:) You told me earlier: we did not want to stress the 'ecological' part, but we wanted to position it as 'good-tasting beer'. (Informant:) Yes, predominantly as 'good-tasting beer'. That has to do with our belief that many ecological beers are primarily put into the market as ecological. Everything is being done to label those beers as ecological. And we feel that there has been not enough attention for real taste and genuine quality."

The second tentative result appears to be dependent on the positioning of competitors, and may therefore be moderated by a market or industry variable. The data do not offer conclusive support for this conjecture.

The two tentative results reported above are indicative of a relationship between market stakeholder orientation and green positioning practices. The patterns seem to correspond with the patterns found for the other antecedent relationships, in that market stakeholder orientation does not have a positive direct effect on greening of processes, products, and introduction, with a positive moderation by green components in the environment. Yet, the results for introduction characteristics are insufficiently strong to test any hypotheses to this effect.

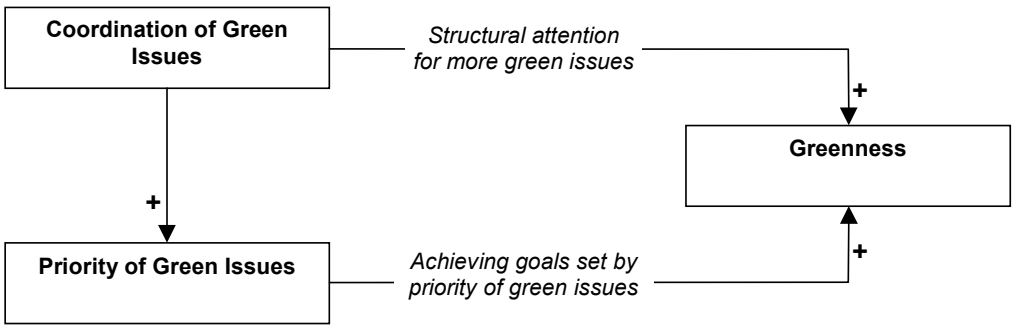
5.9 Causal Relationships between GPI Strategy Constructs

The previous section dealt with antecedents of GPI strategy. We now turn to two relationships between constructs that constitute GPI strategy: first between process characteristics and product characteristics, then between product characteristics and introduction characteristics.

Process Characteristics and Product Characteristics

Process and product characteristics are directly related. As shown in Figure 5.4, coordination of green issues is positively related to greenness, and priority of green issues is positively related to greenness. For each relationship, a single underlying logic emerged from the data. Each logic will be discussed below.

Figure 5.4: Process – Product Characteristics (Association & Logic)



1. *Structural attention for more green issues.* High coordination of green issues implies that attention for green issues is, firstly, more structural and, secondly, directed to more green issues. More structural attention implies that green issues are not easily overlooked during the process, which improves the likelihood that improvements are realized on green issues in the final product. Directed to more green issues implies that several avenues of greening the product can be pursued, which stimulates a more comprehensive perspective on greening. A comprehensive perspective on greening raises the likelihood that improvement on one issue is not achieved at the expense of another, overlooked, green issue. Thus the overall greenness of the product is improved by including more green issues in the process. The effect of coordination on greenness is most visible from SquirtEco data, because the focal organization in that case had projects with varying levels of coordination of green issues. The following quote, taken from a segment in which an informant explains that the green coordination procedure was not entirely followed for SquirtEco, illuminates the consequences of a lower level of coordination of green issues:

   > "If the feasibility document had followed the route then, as is the case nowadays, the issue would have been noticed. We would have had a different trigger spray. (Interviewer:) So would you say that a different solution would have been chosen? (Informant:) Then it would have been included in the requirements, and the management would have considered it and they would have, I think… If you see what is happening nowadays with the feasibility document… it is adhered to rather precisely. I am almost sure that the trigger spray we have now would not have been the result of the process and that we would have had a more ecological version of the bottle."

   Therefore, ceteris paribus, high coordination of green issues is related to highly green products.

2. *Achieving goals set by priority of green issues.* High priority of green issues implies that, when faced with a trade-off between green and non-green issues during the product development process, green issues prevail over non green issues relatively often. This means that, implicitly or explicitly, goals will be set for green attributes of products. In the Hardcoat case this goal was explicit: a maximum VOC level for the product was set in the beginning of the project. In this case, the goal was realistic and the product development team succeeded in developing a very low VOC, thus green, product. SquirtEco provides another illustrative example. The project would have received a 'no-go' decision if a substantial improvement was not made on biodegradability of the product, compared to the old all-purpose cleaner that was being marketed at that time. In this case, high priority of green issues led to the goal of using biosurfactants in the product. The project team succeeded in achieving this goal, albeit partially because biosurfactants were too expensive to be the only detergent in the product. Thus, the product that was finally developed was greener than it would have been if low priority had been given to biodegradability. An R&D informant, who had the power to cancel the project as a member of the management team, looked back at the process and explains:

> "I threw my full weight into it, at the development of SquirtEco. At first, I was not carried away by this SquirtEco idea. Why? It really is a diluted version of an all-purpose cleaner. I mean, all-purpose cleaner in itself you cannot really call a concentrated product. The proportion of active substances is relatively low. But SquirtEco is a heavy dilution of that, into a ready-to-use product, with a hefty chunk of packaging around it and a leaden spray. (Interviewer:) It's really not much more than water? (Informant:) Yes. Water and ethanol. It contains mostly ethanol. It really contains very little detergent. And that's why I was not so carried away with the product concept initially. Then I threw my full weight at the issues, so to say, and I said: 'without bio-surfactants this whole thing is a no-go as far as I'm concerned.'"

The relationship between priority of green issues and greenness of the product is often implicit in the answers of case informants. Many informants do not even make the distinction and present greenness of the product as 'evidence' for high priority of green issues in the development process. The descriptive analysis in Section 5.3 and 5.4, however, showed that the two constructs are different.

The two logics lend support to a direct and positive relationship of both coordination and priority of green issues with greenness. Both logics described above occur, although not always together. They do occur together in the SquirtEco case, but in other cases one logic is dominant over the other or both logics are less pronounced. Please note that process characteristics are not the only antecedent of greenness. Therefore, the association of process characteristics with greenness displayed in the summary results (Table 5.11) is not perfect.

Product Characteristics and Introduction Characteristics

The relationship between product characteristics and introduction characteristics can only be understood when we determine the source of comparative advantage of the product. If the major source of comparative advantage is greenness rather than relative advantage, green targeting and green positioning increase. The relationships show moderation by industry environment. In discussing the relationship between product characteristics and introduction characteristics, the concept of comparative advantage will be discussed first, followed by the three identified logics for the relationship.

The theoretical framework in Chapter 3 proposes a direct relationship between greenness on the one side and green targeting and positioning on the other. The case data show, however, that both relative advantage and greenness have a joint effect on green targeting and positioning. Relative advantage and greenness both determine comparative advantage. The concept of comparative advantage originates in the resource-advantage theory of competition (Hunt and Morgan 1995; Hunt and Morgan 1996; Hunt and Morgan 1997). In the current study, and based on the empirical findings in the cases, comparative advantage is derived from 'relative resource-produced value' and exists when a company develops a product that, "relative to extant offerings by competitors, is perceived by some market segments to have superior value" (Hunt and Morgan 1995, p. 7). This concept of comparative advantage corresponds with the logic found in the case data. The source of comparative advantage has been assessed for each case. The results are tabulated in Table 5.12, alongside the assess-

ments of green targeting and green positioning established earlier, for the reader's convenience. The table shows that the source of competitive advantage can be found in greenness, relative advantage, or a combination of greenness and relative advantage with one of the two dominant.

The major source of competitive advantage depends on a comparison of greenness and relative advantage. Figure 5.5 illustrates this relationship. High greenness increases the likelihood that greenness becomes a source of competitive advantage. This is most clearly observed from the SquirtEco case. Because the product does not have a relative advantage on ready-to-use all-purpose cleaners of mainstream, non-green, competitors, greenness is the major source of competitive advantage. Two products derive their comparative advantage from a combination of relative advantage and greenness. An as example of such a combination, Limburgs Land combines organic ingredients, good taste, and local origin. It is the combination, and the combination *only*, that gives the product its comparative advantage. According to the resource-advantage theory of competition comparative advantage is often grounded in such combinations (Hunt and Morgan 1995, p. 8).

Hardcoat represents a special case. Greenness of the product is high, and relative advantage is low, which would suggest that the product derives it comparative advantage primarily from greenness. Greenness is *not* a source of comparative advantage for Hardcoat, however, for two reasons. The first reason is a convergence of specific product characteristics that renders Hardcoat almost useless for green segments. The product does not deliver superior value to the segment that values greenness because it is incompatible with earlier green technology, i.e. waterborne basecoats. Because green segments have adopted waterborne basecoats on a large scale, Hardcoat is a green product that cannot be used by customers in green segments. In the remaining segments of non-green customers, greenness does not represent much value.

The second reason why Hardcoat's high greenness does not represent value to any segment is the high stringency of green regulation in many markets. As Figure 5.5 shows, stringency has a negative moderating effect on the relationship between product characteristics and the source of comparative advantage. As green regulation becomes more stringent, greenness will become less of a source of competitive advantage. Assuming that regulators craft green regulation in such a way that it does not

Table 5.12: Sources of Comparative Advantage and Introduction Characteristics

Case	Source of Comparative Advantage	Green Targeting	Green Positioning
SquirtEco	Greenness (biodegradability, low aquatic toxicity)	High/very high	High
Hardcoat	Relative advantage (speed, but only for small non-green niche)	Low	Low
Limburgs Land	Greenness combined with relative advantage (organic, with taste & local origin)	High	Low/Moderate
Mussel bag	Relative advantage combined with greenness (freshness & other quality, with less packaging)	Low	Low

yield a monopoly, stringent regulation will result in many green compliant products, thus reducing the opportunities to achieve a comparative advantage through greenness. In stringent markets, greenness becomes a necessary condition to operate in the market, and a stringent market will see many products that are at a parity position in greenness. In such a market, relative advantage is more often than not the source of comparative advantage. This is illustrated by the following quote from an Hardcoat informant, talking about a product for the North-American market:

> "We do not market this product on its VOC level, but purely to offer the customers something unique regarding speed. All of our competitors have products in North-America that are compliant with all regulations over there, so you cannot differentiate with that. But you *can* differentiate with a product that cures in five minutes."

The two explanations offered above explain why relative advantage, in spite of high greenness, is the source of comparative advantage for Hardcoat. The only real comparative advantage that the product has is based in what little relative advantage it possesses, which is in speed of application. Because speed is only of value to a small part of the market, the product's comparative advantage is only present in a small niche. Also, the relative advantage of speed comes with several relative disadvantages. Overall, Hardcoat has very low comparative advantage.

An understanding of the source of comparative advantage is essential for understanding two of the three logics underlying the relationship between product characteristics and introduction characteristics. Green targeting is explained by two underlying logics, and green positioning by one.

1. *Minimum level of greenness required.* A high degree of green targeting requires a minimum level of greenness. This logic explains why light green products do not have high green targeting. The four case study products are all sufficiently green to have high green targeting. The case informants provided comparisons of the case study products to other, less green, products. The underlying logic becomes most clear when comparing the previous, non-organic, product sold under the Limburgs Land brand name, to the case study product Limburgs Land:

   > "As long as it wasn't organic, it wasn't sold in health trade stores. Dark green consumers only buy there. So if it's organic, it is in fact organic for those people too. Then it's in fact like a seal saying: 'It's OK. We can buy it now'."

   Ecolabeling can be instrumental to targeting a dark green segment. The ecolabel lends credibility to the claims concerning greenness of the product. In order to obtain an ecolabel, a minimum level of greenness is required. Above logic explains a positive association between greenness and targeting. After a minimum level of greenness, the association becomes zero, according to this logic.

2. *Comparative advantage greater in green segment.* There is a positive association between greenness being a major source of comparative advantage and green targeting. Greenness has the highest value in dark green segments, because in dark green segments the willingness to give up other characteristics in return for higher

greenness is the highest. An informant for SquirtEco describes this in the context of the laundry detergents, which Ecover markets without optical whiteners:

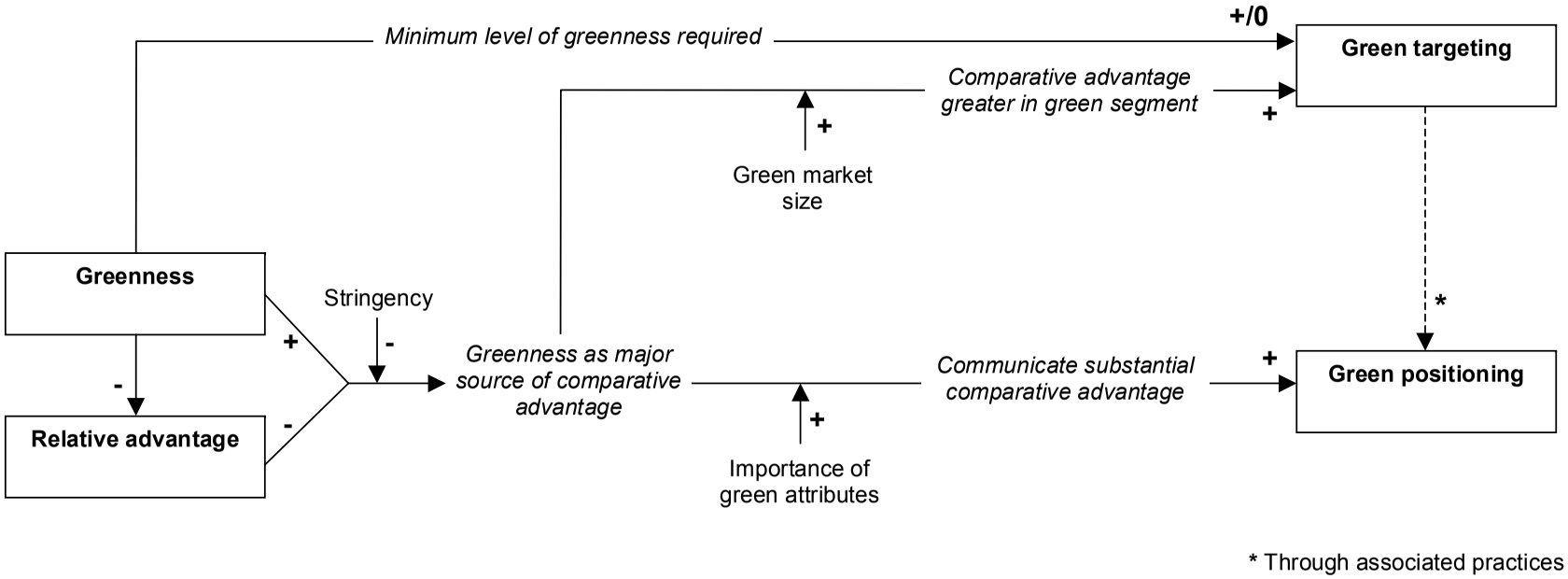
> "A product is underperforming for some consumers, but not for others. Consumers who really want their shirts to be really white, whiter than white, should not buy Ecover. (Interviewer:) So it is much more of a targeting issue? (Informant:) For other persons it has large added value: 'Oh, finally there's a product without optical whiteners, which can cause allergies'."

The above suggests that if a product has a comparative advantage based in greenness rather than relative advantage, a green target market offers the most opportunity to appropriate the value that the product possesses. The Limburgs Land case demonstrates that higher margins can be attained rather in the green segments than in the non-green segments. The relationship, however, is positively moderated by the size of the green market. The market has to be sufficiently large to target green segments. Informants quote green market size as the reason why SquirtEco is targeted at both a light green and a dark green segment instead of a dark green segment only. The dark green segment is simply too small. One informant suggests that the product would have been targeted at a dark green segment a few years ago, but that this market has become too small because less people are willing to give up functional performance for greenness. Similarly, insufficient green market size is quoted as the reason not to engage in green targeting by informants for Limburgs Land. Limburgs Land is the only product of the company that has high green targeting. Other products of the company have a comparative advantage that is less based on greenness, and more importantly, the sales volumes for green segments are very low. In such an industry environment, only a product of which greenness is the major source of comparative advantage can have high green targeting. In the case of Mussel Bag, a green market is completely non-existing, eliminating the possibility of green targeting.

3. *Communicate substantial comparative advantage.* Similar to the previous logic, we observe a positive association between greenness being a major source of comparative advantage and green positioning. The explanation offered by the data is that if greenness is the major source of comparative advantage, a substantial green improvement relative to extant products is communicated to signal superior value to the market. Note that the comparative advantage in greenness has to be substantial, not only to be able to generate superior value for the market segment, but also to be credible. Informants for SquirtEco stressed the importance of being sincere in communicating about green products. Marketing informants explained why the fact that the product contains bio-surfactants is not used in positioning:

> "There are two reasons [for not communicating about biosurfactants]. The first is that bio-surfactants are really still in a development phase. Ecover R&D cooperates with a number of German universities. They assist us in development and application in laundry and cleansing detergents. That's one reason, we want to keep a bit of a low profile. The second reason is that the volume of bio-surfactants in the product, compared to the total of active ingredients, is rather limited. Then a sort of informal code kicks in: we are not going to position the product on bio-surfactants. (Interviewer:) Because in comparison with all active

Figure 5.5: Product Characteristics – Introduction Characteristics (Association & Logic)



> ingredients in the product the proportion is low? (Informant:) Then it becomes a gimmick. That's something we do not want. If things are substantial, we will translate it and tell it to the consumer. So, from the moment that we start using bio-surfactants on a larger scale, *then* we will tell it to the consumer."

Other green aspects of the product were used in positioning the product, in order to capitalize on greenness being the major source of comparative advantage. For the other product where greenness is the major source of comparative advantage, Limburgs Land, the positioning is less green. The explanations offered by informants indicate a moderating effect by importance of green attributes. Informants stress that in the beer market green attributes will always be secondary to other attributes, even in green segments, because of the hedonic nature of beer. One informant stressed the fact that beer is a stimulant, not a food product. In some markets, for instance in the German state of Bavaria, it is a food product, but in the market in which the company operates, it is not. The hedonic properties of beer make it unsuitable for a very green positioning. The product is valued for the enjoyment it offers, and substantial emphasis on the green aspects of beer would take away a defining property of the product, according to informants. For this reason, although greenness is a major source of comparative advantage, the positioning of Limburgs Land is primarily on taste and regional origin, and only secondary on green aspects. Informants for Mussel Bag follow a similar logic. Even if the firm were to develop a much greener product, involving a greening of the entire product chain, it would not be positioned in a very green manner. It does not fit the general positioning of fun and hedonic values that go with mussels. Like with Limburgs Land, green issues about a very green product would only be communicated as secondary, as an informant explains:

> "(Interviewer:) Suppose you had a product that, for instance, was grown in a different way. Would you introduce that differently yet? Would you consider a more green positioning? Or would you still say not to do it… (Informant:) I don't think so, as it does not fit within our strategy, our policy. Yes, one of the anchors of our policy is that we try to consider our environment: social partners, economic partners, environmentally; if you are talking about environment. But in the first place we want people to enjoy eating crustaceans and shellfish. If it were to fit within that picture, then you would tell it. but even then it would be more of a side issue. Something like: 'Eating mussels is fun, enjoyable, and, by the way, we have a mussel that is now guaranteed free of animal testing', to give just a weird example."

Informants for Mussel Bag agree that in such a case green issues would be communicated, through general, not product-related, communication.

Overall, the data show a positive association between greenness as major source of comparative advantage and green targeting and positioning. Given the generally negative relationship between greenness and relative advantage due to trade-offs between green and non-green issues (see Section 5.4), this means that, in general, a positive relationship between greenness and green targeting and positioning is likely to exist. Industry environment is shown to have both negative and positive moderating effects, through stringency, green market size, and importance of green issues.

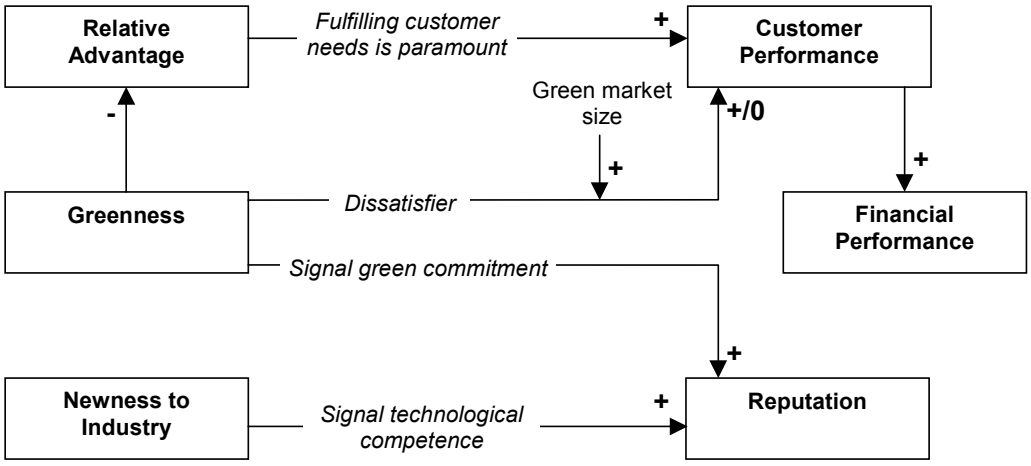
5.10 Causal Relationships between GPI Strategy and Innovation Performance

This section deals with relationships in the right-hand side of the proposed model. The effects of two elements of GPI strategy on innovation performance are tested. First, the relationship between product characteristics and innovation performance is discussed. Second, the relationship between introduction characteristics and innovation performance is discussed.

Product Characteristics and Innovation Performance

The data about the relationship between product characteristics and innovation performance show, above all, a strong positive relationship between relative advantage and customer performance. The comments of informants in all four cases are remarkably identical about this. Even for products that derive their major comparative advantage from greenness, the strongest explaining factor is relative advantage. Fulfilling customer needs is paramount for green products. Next to this logic, three other logics emerge from the data: greenness as a dissatisfier, signaling green commitment, and signaling technological competence (see Figure 5.6).

Figure 5.6: Product Characteristics – Performance (Association & Logic)



1. *Fulfilling customer needs is paramount.* The first and dominant logic offers an explanation for the positive relationship between relative advantage and customer performance. In the data, high customer performance is primarily attributed to relative advantage. Informants provide many statements about comparison products to support this relationship. The logic underlying this relationship is that fulfilling customer needs is paramount, even for products that are identified to derive most of their comparative advantage from greenness (in Table 5.12). Even if a combination of high greenness and low relative advantage occurs, i.e. the product is at parity with regard to functional characteristics, relative advantage is primarily held responsible for the level of customer performance. An informant for Limburgs Land illustrates how consumer needs are at the root of this relationship:

> "What we really said is: this whole green thing is quite nice, but it doesn't really sell. […] We did a market research at some point, and what was found is that people bought our products because of the quality of the product, the taste, because it was from Limburg, and environment was only listed fourth."

An additional, yet similar, explanation for this relationship is in the role of retailers. Informants for all three cases that involved retailers point to the fact that acceptance of new products by retailers is driven by relative advantage. In acting this way, retailers act as gatekeepers to ensure that products with high relative advantage have a much higher chance of being listed in retailers assortments, and therefore of having high customer performance.

The reverse relationship also holds: low customer performance is primarily attributed to a lack of relative advantage or relative *dis*advantage. The low customer performance for Hardcoat, for instance, is attributed to several issues, all related to the relative disadvantages of the product. Conversely, the success of a similar product in the United States that is less green but has higher relative advantage than Hardcoat, is forecast to be higher because of its relative advantage. Another example of how greenness combined with relative disadvantage leads to low customer performance, comes from SquirtEco. Informants point at competitors who have sacrificed functional performance for the benefit of greenness. These 'fundamentalist green' competitors operate in very small niches with little success; these competitors' collective sales reportedly do not even match the sales of Ecover. In this logic, higher greenness leads to lower customer performance, mediated by relative advantage.

2. *Dissatisfier.* In the second logic, the relationship between greenness and customer performance is positive, yet only up to a certain level, after which the relationship becomes zero. Analysis of the causal codes reveals greenness to be a dissatisfier, or hygiene factor (Herzberg 1968). This means that GPIs with a low degree of greenness have low customer performance, because they do not meet certain minimum requirements. It also means that after a certain point, higher greenness does not improve customer performance. Several informants made bold statements to this effect, suggesting even a direct negative effect of greenness on customer performance, like the following fragment of an interview for the Hardcoat case:

> "Green doesn't sell! That's clear. That's what we have learned."

The data reveal however, that if the logic underlying the mediated negative effect is separated from the logic underlying the direct effect, greenness has a direct positive impact on customer performance as a dissatisfier. Evidence for this is provided from several informants, who state relative advantage as the main determinant of customer performance *in combination* with a minimum level of greenness. The following two fragments from a Mussel Bag informant and a Limburgs Land informant, respectively, identify greenness as a dissatisfier:

> "Let's say if we would have been worse for the environment than whatever existed at that time, then I think that would have worked against us."

> "[About greenness] OK, it's the basics, but only the basics doesn't sell any more."

This is mainly explained by the phenomenon of higher requirements made by customers on all aspects, including greenness (see Section 5.4). However, greenness is of secondary importance. Informants sometimes stress that it is an 'and/and proposition', rather than an 'either/or proposition' that has high customer performance. Similarly, informants report comparison products where greenness was low, which led to low customer performance. The product that preceded Limburgs Land, for instance, had a significantly lower degree of greenness compared to Limburgs Land, and was not successful. The reason for its lack of success was that the claims of greenness could not be substantiated by significant improvements on green issues. The data suggest that the direct positive relationship between greenness and customer performance is moderated by green market size. In a large green market, the segment of customers that insists on products having a minimum degree of greenness and/or the required level of greenness is greater. This is observed by an informant for Limburgs Land, comparing the organic beer market in the Netherlands with Germany. Also, informants for Hardcoat report of markets where green regulation is enlarging the green market ahead of regulation, thus raising the minimum acceptable level of greenness in such markets. An informant referred to a recent product introduction, where product acceptance was very different between Germany, with a large green market, and the United Kingdom:

> "Recently we were busy with a new product. Before you could spray another layer over it, you would have to clean it with some solvent. The Germans replied with: 'All our degreasers are currently waterborne, and now you have to clean this with a solvent. Can't you use some waterborne product for that?' In England on the other hand they just used a cloth full of acetone and they didn't care a bit."

Thus, low levels of greenness act as a dissatisfier, but more so in large green markets than in small green markets.

3. *Signal green commitment.* The third logic, although less dominant than the previous two, reveals another positive effect of greenness. A GPI with high greenness is a signal of green commitment to various stakeholders. The clearest example is offered by 'showcase' product Limburgs Land, that reaffirms the reputation of the firm as a frontrunner in corporate social responsibility. The product is a signal to various stakeholder groups to this effect. The product featured prominently in a documentary on Dutch national television, as well as other media. There is evidence to suggest that this media interest yielded an improved reputation, in particular with regulators.

4. *Signal technological competence.* The forth logic that emerged from the data is that green products that are highly new to the industry have a positive effect on reputation. This effect is observed for all three cases involving relatively high levels of newness to the industry: SquirtEco, Hardcoat, and Mussel Bag. An informant for Mussel Bag explains how this signals a competence to leverage technol-

ogy for the benefit of stakeholder groups, and thus leads to a better reputation with these stakeholder groups:

> "We develop new things and we already did that within the production process. And now also in packaging. You establish your name as an authority in mussels. (Interviewer:) That was an objective? Do you think that you succeeded in that? (Informant:) Yes, absolutely. (Interviewer:) Who's the target group? Who should think so about Prins & Dingemanse? (Informant:) Well, for a start your B2B partners… (Interviewer:) You mean wholesale traders, …? (Informant): Yes, they should have the feeling that when they buy Prins & Dingemanse, they do not only buy a brand name, a 'marketed' name, but from a company that really has it in its genes. So that you really have a partner. And that has definitely been achieved. As for consumers: they are not aware that Prins & Dingemanse developed this."

The previous fragment also demonstrates how the effect is differential: it applies to some stakeholder groups, in this case supply chain members, but not to others, in this case consumers. For SquirtEco, similar differential effects are reported: an increased reputation with research centers and supply chain members, but not with consumers.

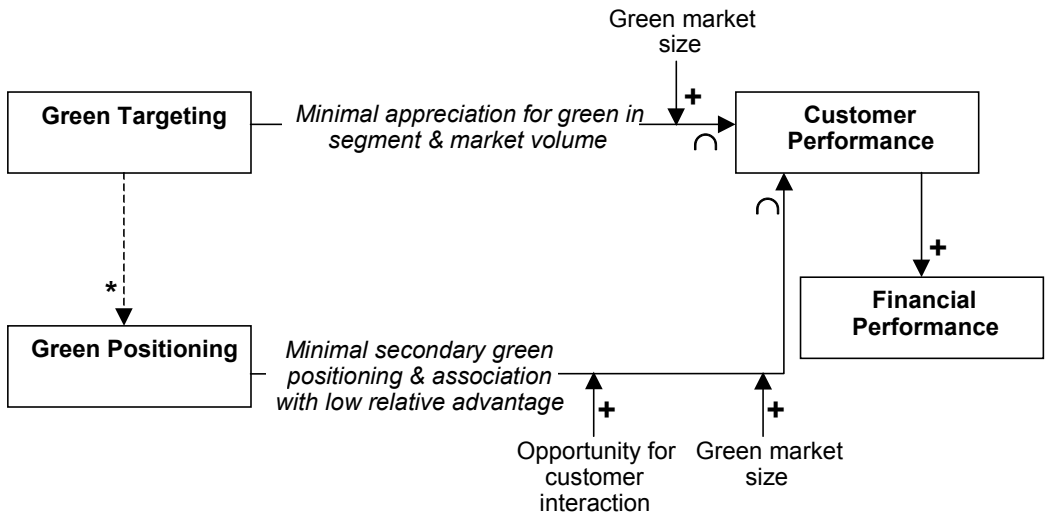
In summary, the results show that green products can be successful, but not because of their greenness. Greenness only has a supporting role to play as dissatisfier. High levels of greenness, combined with low relative advantage, lead to low performance because customer needs are not adequately met. Generally, the negative relationship of greenness with customer performance, mediated by relative advantage, dominates the positive direct relationship of greenness with customer performance.

Introduction Characteristics and Innovation Performance

The data on the relationship between introduction characteristics and innovation performance show two inverse-U association patterns. For each association pattern, the underlying logics are twofold (see Figure 5.7). Optimum levels for green targeting and green positioning are found to exist, and affected by various market-specific variables.

1. *Minimal appreciation for green in segment & market volume.* The relationship between green targeting and customer performance is first positive and then, when the optimum level of green targeting is exceeded, negative. The logic behind this relationship is twofold: a low level of green targeting is detrimental to customer performance because the target segments lack a minimal appreciation for green issues, and a high level of green targeting is equally detrimental to customer performance because the target segment becomes too small. Evidence for the first part of the logic is mainly provided by Limburgs Land. The product's predecessor was targeted at a non-green segment that, according to the data, did not appreciate the greenness of the product. This low level of green targeting is mentioned as one of the reasons why the Limburgs Land predecessor was a failure. The Hardcoat case also shows the effect of a small, albeit not green, target segment on customer performance. The product was targeted at a very

Figure 5.7: Introduction Characteristics-Performance (Association & Logic)



small group of innovative, non-green, customers, which led to very low sales volumes. Evidence for the second part of the logic is most visible in the SquirtEco data. Targeting light green, rather than dark green, segments increases the market potential of a green product enormously, as illustrated by this quote from an interview with a marketing informant:

> "(Interviewer:) The fact that you are targeting a larger target group, is that an explanation for the success? (Informant:) Yes, as far as sales are concerned for sure. We market a hand soap. And half the volume we generate from a supermarket chain in England. […] The other fifty percent is generated from the total health trade channels in 21 countries added together."

The previous fragment also shows the moderating effect of green market size. England has a relatively large organic food products market, which creates a sizeable light green market for detergents in its wake, according to SquirtEco informants. As green market size is larger in one country than the other, the optimum level of green targeting shifts to a higher point by the moderating effect. Thus, the data suggest that an optimum level of green targeting exists and that the optimum depends on green market size.

2. *Minimal secondary green positioning & association with low relative advantage.* A similar pattern emerges for the relationship between green positioning and customer performance. Again, the data suggest an optimum level of green positioning exists. A too low level of green positioning of GPIs has a negative effect on customer performance because failure to communicate the greenness of the product to customers who require a minimal level of greenness can incur lost sales. Even the product with the least green positioning in the case studies, Mussel Bag, has a minimal and secondary communication about the greenness of the product. This takes the shape of 'pull' communication (see Section 5.5), to inform interested stakeholder groups that make an effort to know more about the product's

greenness, for instance through the corporate web site. The reasons given for this basic level of green positioning are similar to the 'dissatisfier' logic. Greenness is of secondary importance, and this translates into greenness being a supportive positioning attribute, rather than a primary positioning attribute. On the other hand, a too high level of green positioning has a negative effect on customer performance, because many consumers associate greenness with low relative advantage or even relative disadvantage. This logic is expressed by a Limburgs Land marketing informant:

> "Organic is very much associated with unpalatable. It's organic, but there it ends. It's foremost unpalatable. And beer is a hedonic product and if you combine the two, the final result is far from optimal, at least in the consumer's eyes. So I have said: you should state somewhere on it that it's organic, but this is of course primarily to get it into these distribution channels. If the consumer believes in it. If the consumer buys it in an organic food store, then he already knows: 'it's organic, otherwise it wouldn't be sold here.' Keep the 'eco' as small as possible. In supermarkets: all right, consumers who want to know it, know it anyway that it's organic. So the whole organic positioning from the past…, what has become clear from organic product initiatives et cetera et cetera…, they all partly failed. Because they stressed: it's organic. But organic does not have value for the consumer because in general, it's not palatable."

The optimum level of green positioning is determined by two moderators: opportunity for customer interaction, and green market size. In markets where interaction with customers is easier achieved, the complexity of green issues can be better communicated, thus making it easier to point out comparative advantages in green issues. In business-to-business markets, it is possible to educate the customer, whereas in consumer markets, marketer will have to 'ride the waves'. Informants for SquirtEco explain how they discovered local authorities as an attractive market, and how it is easier in that market to highlight the complex green issues associated to their products through consumer interaction:

> " (Informant 1:) [Name of local authority] has used 15 thousand worth of products last year and it's still expanding to other departments in the local council and to surrounding local authorities. I think you have to differentiate, also marketing wise, that type of customer where you have direct access to the user and that have direct control over the people that use it. There it is decreed that this product should be used, and that the quantity is so much. On the other hand, I can lament to Mrs. Smith all I want, but if she pours so much in a bucket, than I have no say in that. Then, often, the advantage of an ecological product is gone. But it's reality: with a consumer product you face the masses. (Interviewer:) You establish more of a dialogue with your customer…? (Informant 2:) Yes, if not us, then our sales reps (Informant 1:) They have the direct contact. This is an advantage obviously".

In the SquirtEco case, the company has been very successful in selling its products to local authorities because of the opportunity that business-to-business markets offer to explain the product proposition directly to the customer. An Hardcoat informant points to the same effect, that it is more effective to include green issues in the communication toward car manufacturers than it is toward individual body shops. The opportunity for customer interaction is not the only explanation

why green positioning is more effective in above markets than it is in others. In the SquirtEco case, a higher level of green positioning is effective in the local authorities market also because they constitute a large green market. Many of the local authorities in the Belgian market have local environmental coordinators that instated 'buy green' programs. Thus green market size also has a positive moderating effect. Therefore, the data suggest that an optimum level of green positioning exists, and that this optimum level is positively affected by opportunity for customer interaction and green market size.

Summarizing, the data suggest similar, inverse-U-shaped, effects on customer performance for both green targeting and positioning, moderated by market-specific variables. For relationships with other innovation performance measures, insufficient evidence could be extracted from the case data to warrant theory-testing.

5.11 Discussion

Firstly, findings from the descriptive analysis regarding the constructs will be discussed. Secondly, results from the causal analysis will be discussed, with particular interest for the testing of the propositions forwarded in Chapter 3. Thirdly, a more holistic overview over the four case studies is provided by a summary of the construct assessments and relationships for each case, thus giving way to a typology of GPIs.

Constructs

In the descriptive analysis, constructs were tested for operationalizability and meaningfulness. In this section, implications for operationalization and measurement will be reviewed, so that the validity of measures in future research may be increased. Six conclusions about the operationalization of constructs are drawn.

1. *Multiple measurement levels of antecedents.* The data show that, for some constructs, it is meaningful to make a distinction between a measurement at the level of the product innovation project, and measures at a higher level, e.g. the entire product development program or organization. Top management commitment, scope, and scrutiny were all shown to have at least two levels that are relevant to GPI strategy. Generic scope in stakeholder orientation, for instance, does not refer to any individual product development project, but has been shown to influence coordination of green issues. Also, to obtain valid measurements, researchers should be aware of differences caused by measurement level. For high levels of top management commitment, spillover to the entire organization was observed. Top management commitment in these cases may not be observable separate from organizational commitment. However, top management commitment to green issues is conceptually and empirically different from organizational commitment.

2. *Scope and scrutiny as operationalization of stakeholder orientation.* The results show discriminant validity for scope and scrutiny as components of stakeholder orientation. The degree in which a stakeholder is included in a company's orientation and the degree in which information about a stakeholder enables the company to be proactive are two different concepts. By this operationalization, two results

of the theory-building case studies (Chapter 2) can be incorporated in one stakeholder orientation concept: the fact that orientations exist toward a multitude of stakeholders, and the fact that quality of information on each stakeholder can differ. The results indicate that both market stakeholders and non-market stakeholders can be relevant to GPI, although some non-market stakeholder groups were not deemed relevant in the studied cases. Relevant market stakeholders are customers, competitors, and supply chain members. Relevant non-market stakeholders are regulators, SIGs, 'other firms', and research centers.

3. *Categorical nature of constructs.* Some constructs are adequately described by an assessment of the degree (ranging from 'very high' to 'very low'). For other constructs, a meaningful operationalization should move beyond an assessment of the degree of a construct. Some constructs have categorical properties, as well. The data show that it is meaningful to distinguish systems, tools, and practices in both scope and scrutiny in stakeholder orientation, to distinguish mechanisms for coordination of green issues, approaches for attaching priority to green issues, and practices for green targeting and positioning. These distinctions increase the predictive power of constructs in the causal analysis, and therefore increase criterion-related and nomological validity of the constructs.

4. *Trade-offs between green and non-green issues exist but can be circumvented.* The results show that product development teams face trade-offs between green and non-green issues. How a product development teams approaches such trade-offs can be studied by measuring the priority that is given to green issues. Trade-offs between green and non-green issues represent the essence of the choices that are made in the development process of GPIs. The results show that a trade-off can sometimes be circumvented, i.e. that green and non-green issues *can* be reconciled. This was the case in Mussel Bag. To view GPI strategy *only* in terms of trade-offs would not be justified. This is all the more important because informants in all cases point to growing requirements from buyers, who increasingly demand that products are both green *and* have high relative advantage. These growing requirements imply that reconciling green and non-green issues becomes more valuable to the firm. Furthermore, the results show that trade-offs do not play an important role in introduction strategies for GPIs. Therefore, only studying trade-offs between green and non-green issues would yield an incomplete picture.

5. *Reputation is a relevant performance outcome and differs between stakeholder groups.* One case study, Limburgs Land, proves the existence of showcase GPIs. For such showcase products, reputation is likely to be the major performance outcome. Overlooking reputation as a performance outcome would hinder our understanding of the consequences of GPI strategy. Furthermore, reputation effects are shown to differ between stakeholder groups.

6. *Recognizing the dominant green force improves understanding of the industry environment.* In the four cases, three different dominant green forces were recognized. Even within the same industry, green issues can enter a market environment in different ways, depending on what is the dominant green force.

Identifying the dominant green force improves our understanding of the role that green issues play in an industry. Furthermore, the issue of multiple measurement levels for antecedents, identified in the first conclusion, applies to industry environment as well. Operationalizing the industry environment on a level that is more relevant to the product category (stringency of green regulation for the product category, green market size for the product category) yields higher explanatory power. Thus, criterion-related validity and nomological validity are improved by an operationalization of industry environment on a more disaggregate level .

Relationships

The purpose of the causal analysis was to test the propositions forwarded in Chapter 3 by determining association between constructs and uncovering underlying logics for the relationships. Table 5.13 provides an overview of the theory-testing outcomes, based on the results for all investigated relationships. At least partial support is found for all propositions, except for proposition 5, which is due to insufficient data. Partial support means that the relationship is supported under specific conditions only or for specific variables only (specified under 'remarks' in the table). The theory-testing outcomes reveal four recurring patterns in some relationships, which are discussed below.

1. *Non-market stakeholder orientations increase 'greening', whereas market stakeholder orientations inhibit 'greening'.* Orientations towards non-market stakeholders show a positive relationship with priority of green issues and greenness. Orientations towards market stakeholders show a negative relationship with priority of green issues and greenness. The latter result is different from the propositions forwarded in Chapter 3. The explanation is that market stakeholders predominantly expose needs for non-green attributes. The results show that green issues receive much more attention from non-market stakeholders, in particular SIGs and regulators. Therefore, a wide scope in stakeholder orientation is much more likely to lead to green issues receiving higher priority than a narrow scope. This result can be explained using institutional theory. Institutional theory distinguishes a task environment and an institutional environment (Scott 1987; Handelman and Arnold 1999). In the task environment, buyers, suppliers, and competitors are the main stakeholders, or 'constituents' as they are referred to in institutional theory. The institutional environment on the other hand provides the norms for proper social conduct, and is more likely to put prosocial issues on the firm's agenda than the task environment. The results of the case studies suggest that an orientation towards the task environment (market stakeholders) yields different results from an orientation towards the institutional environment (non-market stakeholders).

2. *Scrutiny in orientation towards customers, SIGs, and regulators are the antecedents to both priority of green issues and greenness.* The antecedents of both priority of green issues and greenness are very similar. In particular, scrutiny shows a similar pattern of relationships with priority of green issues and with greenness. As noted under the previous conclusion, the impact of scrutiny in customer orien-

tation on 'greening' is negative, whereas the impact of scrutiny in SIG and regulator orientation is positive. This result thus identifies scrutiny, and not so much scope, of stakeholder orientation as an important determinant of GPI strategy. This lends support to the inclusion of an 'information quality' dimension, like scrutiny in stakeholder orientation. Research on market orientation has made some inroads towards distinguishing between reactive, low scrutiny, market orientation, and proactive, high scrutiny, market orientation, and the consequences for product innovation. Uncovering latent needs through a proactive market orientation is associated with higher new product success (Narver et al. 2004). It makes intuitive sense that distinguishing latent from manifest needs and future from current developments would be particularly relevant in an emerging domain such as GPI. Recognizing scrutiny as being different from scope in stakeholder orientation, could help to shed light on the contradictory results in the literature on what stakeholder drives the greening of product development, which were identified in Section 3.3 (e.g., Langerak et al. 1998; Polonsky and Ottman 1998; Van Hemel and Cramer 2002). By studying both scope in stakeholder orientation and acknowledging differences in scrutiny, a better understanding is achieved, because scope and scrutiny have been shown to have different effects in this study.

3. *Relationships with green targeting and customer performance show non-linearity.* The relationships of greenness with green targeting and with customer performance are positive, but weakening as greenness increases. In the relationship with green targeting this is because a minimum level of greenness is required for green targeting, and in the relationship with customer performance greenness acts as a dissatisfier, again suggesting that a minimum level of greenness is required. Also, the relationships of green targeting and positioning with customer performance are not linear, but inverse-U-shaped. All these relationships suggest that 'greening' the product and/or the introduction characteristics, has a positive effect at first, but no effect or even a negative effect as the 'greening' increases. The theory-testing case studies thus showed that high levels of greenness lead to lower performance than low levels of greenness. Experimental consumer research into marketing actions with a social dimension has revealed similar results, in that consumer response to low levels of pro-social attributes is more positive than consumer response to high levels of pro-social attributes (Folkes and Kamins 1999; Handelman and Arnold 1999). These results suggest that greening is a matter of 'satisficing', not maximizing or minimizing. Research into managerial decision making in GPI strategies has not recognized the non-linearities identified in the case studies.

4. *Market-specific components in the industry environment moderate relationships.* The moderating environmental factors that were identified include stringency of green regulation, green market size, importance of green attributes, and opportunity for customer interaction. All these constructs are operationalized on a product-specific level, instead of an industry level. In fact, although the research did include environmental factors at the industry level, i.e. green liability risks, amount of pollution, and public concern, these factors were not found to moderate the relationships. This result is different from most existing research. For instance,

Table 5.13: Theory-Testing Results

Proposition		Support[a]	Remarks
1a	Top management commitment to green issues increases coordination of green issues in the product development process	Partial	Only if top management does not use direct control
1b	Top management commitment to green issues increases priority of green issues in the product development process	Yes	N/A
2a	Scope and scrutiny of stakeholder orientation increase increases coordination of green issues in the product development process	Partial	Only for scope in generic stakeholder orientation
2b	Scope and scrutiny of stakeholder orientation increase increases priority of green issues in the product development process	Partial	Only for scrutiny in SIG and regulator orientation
2c	The positive effect of stakeholder orientations on innovation process characteristics is greater in high environmental impact industries than in moderate environmental impact industries.	Yes	Moderation by stringency of green regulations
3a	Scope and scrutiny of stakeholder orientation increase the greenness of the green products that are developed.	Partial	Only for scrutiny in SIG and regulator orientation
3b	Scope and scrutiny of stakeholder orientation increase the newness of the green products that are developed.	Partial	Only for scrutiny in customer orientation
3c	The positive effect of stakeholder orientation on innovation product characteristics is greater in high environmental impact industries than in moderate environmental impact industries.	Yes	Moderation by stringency of green regulations and green market size
4a	Coordination of green issues in the product development process increases greenness of the green products that are developed.	Yes	N/A
4b	Priority of green issues in the product development process increases greenness of the green products that are developed.	Yes	N/A
5a	Scope and scrutiny of stakeholder orientation increase the degree of green targeting.	No	N/A
5b	Scope and scrutiny of stakeholder orientation increase the degree of green positioning.	No	N/A
5c	The positive effect of stakeholder orientation on introduction characteristics is greater in high environmental impact industries than in moderate environmental impact industries.	No	N/A
6a	Greenness of new products increases the degree of green targeting.	Partial	Only if greenness is a major source of competitive advantage
6b	Greenness of new products increases the degree of green positioning.	Partial	Only if greenness is a major source of competitive advantage
6c	The effect of greenness of new products on introduction characteristics is different in high environmental impact industries from moderate environmental impact industries.	Yes	Moderation by stringency, green market size, and importance of green attributes
7a	Greenness increases financial, customer, technological innovation performance, and reputation with stakeholders.	Partial	Only for reputation, and up to certain level of greenness for customer performance
7b	The effect of greenness on innovation performance is different in high environmental impact industries from moderate environmental impact industries.	Yes	Moderation by green market size

Table 5.13: Theory-Testing Results (continued)

8a	Green targeting and positioning increases financial, customer, technological innovation performance, and reputation with stakeholders.	Partial	Only for customer performance, and up to certain level of green targeting and positioning
8b	The effect of green targeting and positioning on innovation performance is different in high environmental impact industries from moderate environmental impact industries.	Yes	Moderation by green market size and opportunity for customer interaction

[a] Yes = Proposition is supported (null-hypothesis of no relationship is rejected); No = Proposition is not supported (null-hypothesis of no relationship is not rejected); Partial = Proposition is partially supported (null-hypothesis of no relationship is rejected, but under specific conditions or for specific variables only)

Banerjee et al. (2003) find significant moderating effects of 'industry type' on relationships between antecedents and characteristics of green strategy. The research reported in this chapter is at a lower aggregation level than most of the research that has identified moderating effects for the industry environment. Whereas the latter is usually concerned with general strategy, the research in this chapter deals with project-specific GPI strategies. For a model on a project-specific level, project-specific environmental factors offer a better understanding of the relationships. Furthermore, one of the identified moderating factors, opportunity for customer interaction, does not relate to the impact that green issues have on an industry. It resounds, however, the notion forwarded earlier in these conclusions that for understanding green positioning not only the *degree* should be taken into account but also the *practices* that are used. If we take into account that a commonly observed practice in green positioning in the case studies was to engage in secondary marketing communication (where the customer has to engage in some effort to obtain information), the moderating role of 'opportunity for customer interaction' has intuitive appeal.

In summary, the causal analysis of the four case studies has yielded new insights that have not, or only incidentally, been included in research into GPIs. The consequences of these insights for further research are discussed in Chapter 6. Please note that the previous results are based on bivariate relationships only. The case data, however, are also appropriate to study the relationships in GPI strategy within their contexts of the respective cases.

The Four Case Studies Revisited: Towards a Typology

In order to reflect on the results beyond bivariate relationships, the dominant and non-dominant relationships for each of the four selected case products are depicted in Figure 5.8. In doing so, the figure provides a complete overview of the assessments of the level of the constructs, as well as the established relationships for each case study. Bold arrows in the figures indicate dominant relationships. Dominant relationships have been identified by determining (1) in which case the evidence for a relationship was particularly strong, and (2) what were the most important relationships that explain the association in each case. Please note that relationships in the causal analysis were sometimes also established by comparing products other than the case study product. That additional information about relationships is not contained in the figure,

so it would be misguided to interpret Figure 5.8 as a summary of the whole analysis. Furthermore, moderating effects are not included, for the sake of clarity.

Considering the patterns of relationships for each case, the most salient differences are observed in the antecedents and in the outcomes of the model. On the antecedent side of the model, the difference in impact of top management commitment to green issues is most salient. In both case studies where top management commitment to green issues is high, SquirtEco and Limburgs Land, it is a strong antecedent for 'greening' GPI. In the two cases with moderate commitment, other antecedents offer a better explanation for 'greening'. For Hardcoat, regulator orientation, with a strong moderating effect of stringency of green regulation, is the main explanation for 'greening'. For Mussel Bag on the other hand, a green product was only developed after the product development team had discovered a solution that could reconcile high greenness with a moderate level of relative advantage. None of the antecedents offers a strong explanation for the GPI strategy observed in this case. On the outcome side of the model, we see that the introduction characteristics for SquirtEco and Limburgs Land account for the customer performance outcomes. For Hardcoat and Mussel Bag, customer performance is determined by relative advantage. Note that the former two are case studies with high top management commitment to green issues, whereas the latter two have moderate top management commitment to green issues.

The holistic appraisal offered by Figure 5.8 gives way to a typology for GPIs, based on the four case studies. This typology is not intended as an exhaustive inventory of different types of GPIs, but is instrumental in understanding the four cases. Each of the four types will be described, offering a brief summary of the salient findings in each case study.

- *SquirtEco: Social responsibility with rational planning.* The case shows how social responsibility can be methodically and consistently integrated into innovation strategy by maintaining a wide generic scope in stakeholder orientation and high top management commitment to green issues. In the case study, a multitude of mechanisms, both redundant and active, were observed that ensure that green issues are integrated in innovation strategy. Through rationally planned inclusion of green issues, a product was developed with greenness as the major source of comparative advantage. The product was supported by a highly green targeting and positioning strategy. This planned approach of GPI strategy yielded high rewards in terms of customer performance. The results for the case study product appear to apply beyond individual projects, but to the entire product development program instead.

- *Limburgs Land: Social responsibility and reputation building.* The case shows considerable similarity with SquirtEco: in both cases, the firm is highly committed to social responsibility, which impacts the product development process. There are two major differences with SquirtEco, however. The first difference is the motivation for developing the product. Rather than developing a product that is capable of attracting a large number customers, like in SquirtEco, the firm wanted to develop a small niche product that, above all, is an exemplar for the company's socially responsible management practices. Limburgs Land is a show-

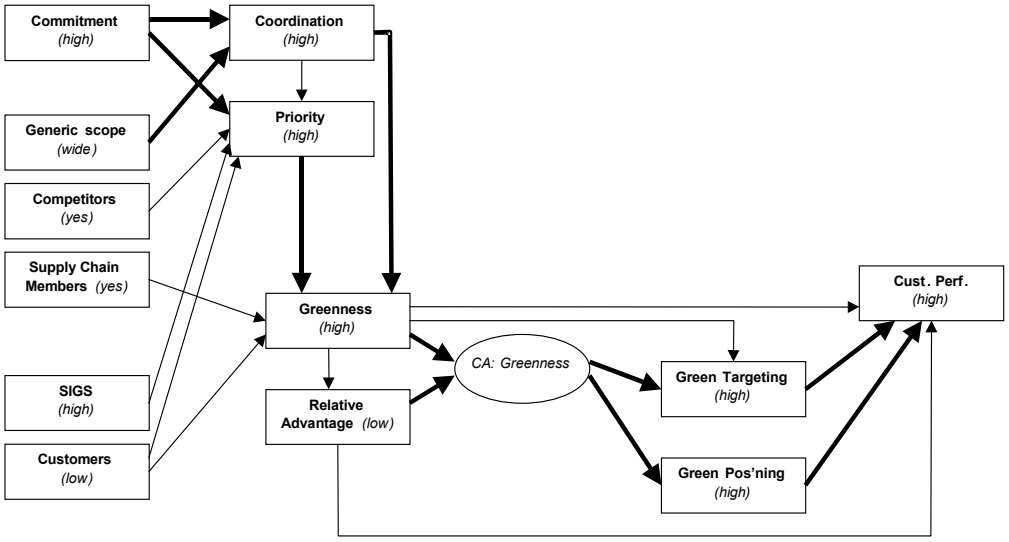
case product intended to enhance and build the firm's reputation of corporate social responsibility. This is not to imply that the product is an example of 'greenwashing' and that the company's efforts are not genuine, but merely that the product is a vessel to communicate its genuine efforts. The second difference is the lack of coordination in GPI development process, compared to the rational planning in SquirtEco. The incorporation of green issues in the product development process is not driven by a high degree of coordination, but by a very high top management commitment to green issues, and consequently a determination to show that commitment to the outside world. The case study shows an alternative route for including a philosophy of social responsibility into innovation strategy, i.e. by direct control over green issues by top management rather than methodically and consistently incorporating green issues in the product development program. Furthermore, the case study product appears to be exceptional within the product development program of the firm in the sense that it is developed as a showcase product.

- *Hardcoat: Legitimation by compliance.* In this case study, regulation was very much the driving force of greening the product innovation strategy. Because scrutiny in regulator orientation was low, however, regulatory developments were not 'read' correctly. Because the company operated in environments with stringent regulation, the partially inadequate information gathered through a stakeholder orientation played an important role in the product development. Future compliance was the central issue. A highly green product was the result, at the expense of relative advantage. Relative advantage was even further diminished by unique circumstances, making the product incompatible for a large group of users. Although the company was a frontrunner in developing this green product, the underlying motivation was not one of minimization of ecological consequences. The purpose of the product development efforts was to achieve legitimation with institutional stakeholders and thus maintain a 'license to operate' and long-term survival.

- *Mussel Bag: Competitiveness by serendipity.* Mussel Bag was not intended as a highly green product, but through serendipity a product was developed that was both green and had a moderate relative advantage. In this case, the antecedent relationships are not strong. The observed pattern of antecedents, however, does point to an underlying motivation of improving long-term profitability through innovating. The product was 'greened' when the opportunity arose to do so without compromising other attributes of the product. This case is of interest because it shows that a 'free lunch' is possible, i.e. that greenness need not be achieved at the expense of functional characteristics. This corresponds to the prediction of the Porter Hypothesis (Porter and Van der Linde 1995b; Porter and Van der Linde 1995a). The product, as predicted by Porter, has high customer performance, and has even proved to change the market environment in that the used technology constitutes

Figure 5.8: Dominant and Non-dominant Relationships for Each Case

(a) SquirtEco



(b) Hardcoat

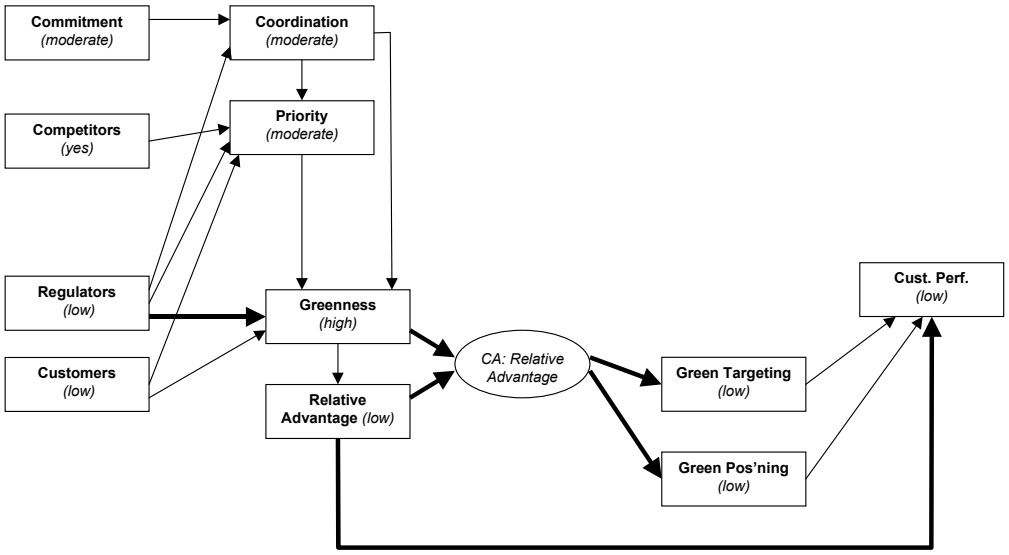
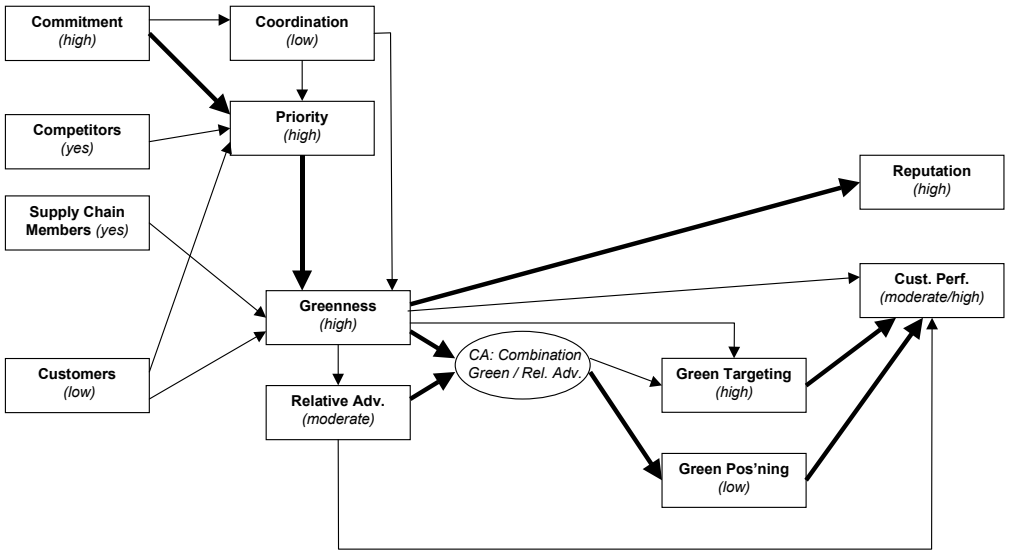
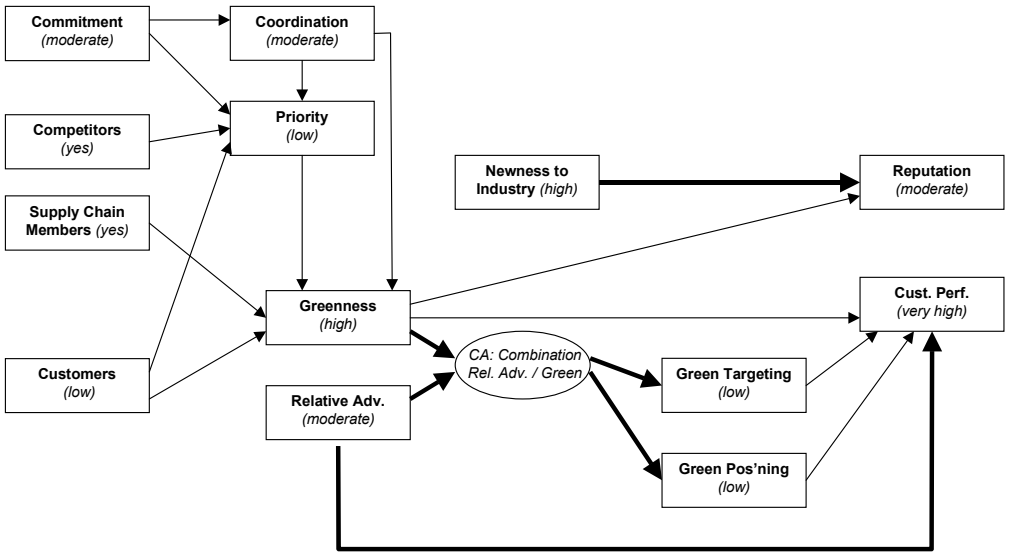


Figure 5.8: Dominant and Non-dominant Relationships for Each Case (cont'd)

(c) Limburgs Land



(d) Mussel Bag



the ‘dominant design’. However, the case studies also suggests that the Porter Hypothesis is flawed, because it assumes that stringent regulation leads to the development of ‘free lunch’ GPIs. The Mussel Bag suggests the contrary: it was developed serendipitously, over a very long period of time, and was not spurred by stringent regulation.

Above types indicate three basic patterns, based on the antecedents of GPIs: social responsibility, legitimation, and competitiveness. Bansal and Roth (2000) established a typology with the previous three categories, based on motivations for companies to adopt a green strategy. The case study data for Mussel Bag fit well within in the case study findings of Bansal and Roth for the ‘competitiveness’ motivation. Hardcoat has a strong fit with the ‘legitimation’ type, except for the fact that the mimetic or imitative stance that Bansal and Roth find for this type was not observed in the case data. Limburgs Land and SquirtEco fit extremely well in Bansal and Roth’s description of the ‘social responsibility’ type, yet the theory-testing studies show that within this type structural differences may be observed. The fact that the theory-testing case studies to a large degree replicates Bansal and Roth’s typology for green strategy in the context of GPIs suggests external validity for the findings of the theory-testing cases.

Chapter 6: Conclusions

In this dissertation, the results of twelve case studies in two industries are reported. In total, 42 interviews, lasting approximately 68 hours, with 45 informants were completed. In addition, documents were analyzed. With these data, a theoretical model of antecedents, strategies, and consequences of green product innovation was first developed, then tested. This chapter lists the contributions of this research to the literature and implications for practitioners. Moreover, limitations and implications for further research are discussed.

6.1 Contributions

The findings suggest several important contributions to (1) literature about the market orientation-innovation-performance relationship, (2) literature about the antecedents and consequences of GPIs, and (3) case research methodology. Contributions to each field will be elaborated upon.

Contributions to the Market Orientation and Product Innovation Literature

In the product innovation literature, the conception that market orientation has an impact on some aspect(s) of product innovation strategy, en route to performance, has gained considerable support over the last decade (Atuahene-Gima 1995; Gatignon and Xuereb 1997; Han et al. 1998; Lukas and Ferrell 2000; Wren et al. 2000; Ingenbleek 2002; Frambach et al. 2003; Leskiewicz Sandvik and Sandvik 2003; Deshpande and Farley 2004; Hult et al. 2004; Im and Workman 2004; Langerak et al. 2004). The findings of the theory-building cases indicate that GPI is not fundamentally different from other product innovation, yet studying GPIs draws attention to issues that have been largely overlooked in current product innovation research. This study makes two contributions to the literature about market orientation and product innovation strategy.

Firstly, the results show that broadening the market orientation concept to include market as well as non-market stakeholders yields a more complete understanding of the market orientation-innovation-performance relationship. In the past, calls for a broadening of the market orientation construct have been made (Kohli et al. 1993; Slater and Narver 1995; Handelman and Arnold 1999). Consequently, the concept of a stakeholder orientation has been proposed (Greenley and Foxall 1996; Greenley and Foxall 1998; Maignan et al. 2002; Maignan and Ferrell 2004; Matsuno et al. 2005). This study is one of the first to investigate the impact of stakeholder orientation on product innovation strategy en route to performance. The results indicate that orientation towards non-market stakeholders has an impact on product innovation strategy, and thus indirectly on performance, that is *different* from the impact that an orientation towards market stakeholders has. For orientations towards market stakeholders, mostly negative relationships with greening were observed, whereas orientations towards non-market stakeholders mostly had a positive effect on greening.

Secondly, this research shows that including a 'quality of information' aspect in market orientation, making a distinction between information that allows the organization to be reactive versus proactive, improves our understanding of the relationship between market orientation and innovation strategy. Recent literature has already produced some evidence to this effect for the market orientation construct (Narver et al. 2004; Atuahene-Gima et al. 2005), but the results of this dissertation also corroborate these findings for a broadened market orientation construct that includes market as well as non-market stakeholders. In doing so, evidence is presented for the validity of a market orientation construct that encompasses both the scope as well as the scrutiny of information generation.

Contributions to the Green Product Innovation Strategy Literature

Although GPIs are a much researched phenomenon in the environmental management literature, extant research in that field has rarely studied GPIs using a perspective is firmly grounded in conventional product innovation research. Specifically, this dissertation makes four contributions to the literature about GPIs.

First, this dissertation offers a systemized framework grounded in the extant product innovation literature to study greening of product innovation strategy. The framework is based on literature linking market orientation to product innovation strategies and innovation performance, which has become a dominant perspective in the product innovation literature. This is the first study to use this perspective on GPIs. Furthermore, the framework developed in this dissertation is more comprehensive than existing frameworks. The conceptual model, developed in Chapter 3 and tested in Chapter 5, integrates development process characteristics, product characteristics, and commercialization variables, as called for by Pujari et al. (2003).

Second, results of the theory-testing case studies point to non-linearity in relationships between greenness, introduction characteristics, and customer performance. The results show that performance effects of greener products or greener introduction strategies are asymmetrical or even inverse-U-shaped. To the best of my knowledge, such non-linear effects have not been empirically established in research into managerial decision making in GPI strategies. A non-linear relationship between greenness and performance has been predicted based on theoretical modeling (Chen 2001). Also, asymmetry in customer response to pro-social product attributes has been established in experimental settings (Folkes and Kamins 1999; Handelman and Arnold 1999). The theory-testing case studies show that similar non-linear effects are found also when researching managerial decision making in GPI strategy. In line with studies in environmental management and environmental economics into performance effects of 'greening' efforts, this finding is an important contribution because similar non-linearity could be present on a higher aggregation level also. Including non-linear effects when researching the relationship between green efforts and company performance could greatly improve the explanatory and predictive power of the models in this stream of research.

Third, this dissertation makes a contribution to a better understanding of moderating effects in modeling antecedents and outcomes of environmental strategies. A moder-

ating role for industry environment was found at the level of 'general' environmental strategy (Banerjee et al. 2003). This study sheds light on the workings of these moderating effects on a more disaggregated level. On the level of product innovation strategies, market environment, not industry environment, moderates relationships between antecedents and outcomes of green strategy. Specifically, components of the market environment that are relevant to the product category, such as stringency of green regulation and green market size for the product category, are shown to be responsible for the moderating effects.

Fourth, both the theory-building case studies as well as the theory-testing case studies point to a much overlooked performance outcome in product innovation research, i.e., reputation. Menon and Menon (1997) identify a need for a performance measure that combines economic and green performance of business strategies. Several conceptualizations of performance outcomes of green business strategies have been forwarded, such as reputational measures (Menon and Menon 1997; Maignan and Ferrell 2004), 'goodwill' (Murray and Vogel 1997), (inter-)organizational identification (Drumwright 1996), and legitimation (Handelman and Arnold 1999). However, performance measures that encompass both economic and green aspects have rarely been used in empirical studies into the performance effects of environmental business strategies (González-Benito and González-Benito 2005 being an exception). This dissertation is, to the best of knowledge, the first study to include reputation as a performance outcome in the product innovation literature. Including reputation as a performance measure is particularly salient for GPI strategies, as shown in the case studies, and ignoring reputation effects yields a piecemeal understanding of GPIs at best.

Methodological Contributions

Although not the prime objective of this dissertation, the case studies in this dissertation render some methodological considerations about the use of case studies in marketing and product innovation research. Most case studies in the marketing and product innovation literature are, like the theory-building case studies in Chapter 2, of a predominantly explorative nature (e.g., Workman 1993; Drumwright 1994; Drumwright 1996; Hillebrand and Biemans 2004). The theory-testing case studies show, however, how case studies can also be used for theory-testing purposes. Although this is acknowledged throughout the case methodology literature (Bonoma 1985; Miles and Huberman 1994; Yin 1994; Johnston et al. 1999), the use of case studies for theory-testing purposes is extremely rare in the marketing and product innovation literature. The theory-testing case studies are the first known application of the method for theory-testing proposed by Hillebrand et al. (2001). Furthermore, an innovative interview procedure, prompting the informant to use both backward and forward logic (see Chapter 4) was devised to increase the amount of data for the testing of relationships. The case studies in this dissertation show that case studies not only contribute to an understanding of singular issues in product innovation management, but also that the used theory-testing approach yields an understanding of relationships between constructs *beyond* mere association.

6.2 Practical Implications

Several implications for practitioners can be formulated from the results of this dissertation. First, implications for managers dealing with product innovation strategies are discussed, followed by implications for public policy makers.

Implications for Managers

The model for GPI strategy provides insights in how firms manage interfaces with multiple stakeholders and the effects on GPI strategies and outcomes. The entire model can be of assistance to managers wishing to develop products that benefit both firm performance and ecological preservation (Porter and Van der Linde 1995a), because it identifies factors that relate positively to innovation performance and factors that do not. Specifically, four implications for managers arise.

The first implication for managers is to guard against 'over-greening'. The presence of non-linearities in the relationships between greenness, introduction characteristics, and customer performance indicate that greening, be it in the product itself or in introduction characteristics, does not always improve performance. An optimum level of greening exists, i.e., 'greener is not always better'. The case study data provide evidence that 'over-greening' sometimes takes place: informants reported about small competitors that market extremely green products, using highly green targeting and positioning strategies. These very green niche players are reported to have very low innovation performance. Furthermore, the case data show low performance outcomes when relative advantage is sacrificed for a high degree of greenness. 'Over-greening' can be avoided by circumventing trade-offs between greenness and relative advantage.

Secondly, and as a consequence of the first implication, managers should be aware of trade-offs between green and non-green issues and adopt methods that can resolve these trade-offs. Ideally, a way to circumvent the trade-off between green and non-green issues should be found. The case data suggest, however, that this can take a lot of time and/or resources. If a trade-off is not circumvented, an optimum level of greenness is to be found. The normative-ethical literature on GPI has traditionally recommended life-cycle analysis or other environmental costing methods as the preferred method, but the current study points at several alternatives. Such alternatives include setting green constraints, ecolabel standards, benchmarking, and rank-ordering stakeholder issues.

Thirdly, the study points at the positive offsets of scope and scrutiny in stakeholder orientation. Whereas managers in recent years have tried to improve the market orientation with regard to product innovation strategies, they will be more able to deal with green issues if they include non-market stakeholders in their orientation as well. Non-market stakeholders can have an important impact on GPI strategies, especially in environments with stringent green regulation. The results of the theory-testing case studies show that generating information about non-market stakeholders has a positive impact on 'greening' the product development process and product characteristics. Therefore, managers seeking to develop GPIs would be wise to generate infor-

mation about a range of non-market stakeholders. A method for increasing the scope is to implement a stakeholder management system. Furthermore, the case studies show that information about stakeholders can be generated that allows the firm to be proactive. Methods for generating such high-scrutiny information include establishing dialogues and regulatory early warning systems.

Fourthly, the emphasis that each of above implications should receive is likely to depend on the market environment and strategy type. Market environments that shift he optimal level of greenness to the deeper green end have high stringency and a sizeable green market. In a stringent market environment, for instance, the level of greenness is largely dictated by regulators, and a firm stands to benefit most of a stakeholder orientation that includes regulators in its scope and employs high scrutiny. Moreover, GPIs were shown to differ significantly among each other, depending on the motivations for companies to include green issues in product innovation strategies. The typology in Chapter 5 distinguished three basic patterns, based on antecedents of GPIs: social responsibility, legitimation, and competitiveness. Tentative implications are as follows. Managers in 'social responsibility' companies that want to push the envelope in greening product innovation strategies will find a wide scope in generating information beneficial. Managers in a 'legitimation' company should focus on collecting high-scrutiny information about non-market stakeholders, particularly regulators. This likely to be the case for organizations where regulators are principal stakeholders, like quangos (quasi NGOs, like the Producer's Organization of the Dutch Mussel Culture) and utility companies. Managers in a 'competitiveness' company should heed the first and second implication and devote effort towards finding the right balance between green and non-green issues.

Implications for Public Policy

Although this study does not focus on public policy decision-making, the case data suggest recommendations for public policy makers. Green market size and stringency of green regulation, through their moderating effects, help increase the level of greening in several aspects of product innovation strategies. Public policy makers determine the stringency of green regulation directly, and the case data suggest that public policy makers also can help to increase green market size, e.g. through convenants. In these cases, intervention by public policy makers has made a difference, as can be observed from those cases with significant intra-case variation in the importance of green issues in the market environment.

In case of non-intervention by public policy makers, GPI strategies are likely to originate mostly from the 'competitiveness' type of companies and a few 'social responsibility' companies. The results suggest that the 'competitiveness' type of companies can indeed develop 'win-win' GPIs, but only with considerable effort and aided by serendipity. Intervention by public policy makers makes it easier for 'social responsibility' companies to further 'green' their product innovation strategies, and brings the 'legitimation' companies into action. Therefore, the results of the case studies suggest that public policy makers should not rely only on companies that serendipitously develop green competitive products, but to actively intervene, either through more stringent green regulation or stimulating green markets to develop. Furthermore, the

dominant green force differs between market environments. If public policy makers are aware of the green dominant force, they can decide to further increase its impact on greening, or alternatively, attempt to make another environmental component, like regulation, the new green dominant force.

A word of caution for policy makers is appropriate, though. In the theory-testing cases, examples of perverse effects of public policy interventions were encountered. Interventions that are intended to benefit green issues induced companies to develop less green products instead. Systems, tools and practices for resolving trade-offs between green issues that were identified in the case studies, like lifecycle analysis, can assist public policy makers to prevent perverse effects and design well-crafted interventions.

6.3 Limitations

This dissertation has several limitations, mostly due to the method employed. The case study method allows for detailed observation of phenomena in product innovation strategies that otherwise would have remained hidden, as well as an understanding of relationships between constructs beyond mere association. It is, however, also the source of several limitations. It is important to realize what *can* and *cannot* be established using the chosen methods.

Firstly, although much has been done to improve generalizability of the case study results, results from a limited set of case studies can never be as generalizable as results from large-sample methods. The findings reveal what is particularly singular about GPIs and establish support for relationships between important elements of GPI strategy, and yield a typology. The findings do *not* reveal, however, the incidence of phenomena, e.g., what percentage of product innovation strategies are characterized by high priority of green issues. Nor do the findings reveal which relationships are more prevalent, or what is the exact strength of each relationship. The results show which relationships exist, and why. Indications of the shape of relationships were uncovered, but the case study method is unsuited for determining the exact shape of the relationship. For instance, a 'dissatisfier' logic was shown to underlie a non-linear relationship between greenness and customer performance, but we do not know whether the shape of this relationship is increasing with a declining slope or more like a threshold-effect (hysteresis), nor do we know the defining parameters of the shape. Furthermore, the typology proves the existence of certain combinations of phenomena, but we do not know the frequency in which each type occurs, nor can we be assured that the typology is comprehensive.

Secondly, a potential bias may exist because informants could have, consciously or unconsciously, based their answers on incorrect causal attributions. The assessments of the level of the constructs was done with great care, using triangulation wherever possible. Relationships were then tested using association and underlying logic. The causal attributions by the informants are prone to biases, because of collectively shared, yet wrong, beliefs about which decision leads to which outcome. Therefore, the underlying logic was formulated primarily by the *researcher*, rather than relying on the causal attributions made by the *informants*. This means that the statements of

the informants were carefully evaluated, and that the researcher's interpretations of the statements about relationships formed the basis of the underlying logic. However, the logic to explain the association, may still be flawed. Decisions that were taken, and in hindsight led to positive outcomes, may in fact have been far from optimal, and different decisions that were never tried, either within or out of the company, might have had much better results. The possibility that bias entered the theory-testing method in this manner cannot be completely excluded.

Thirdly, not all possible relationships could be tested. Proposition 5 was not supported because the data were lacking. This is inherent to the case method employed, because the richness of the collected data can never be entirely controlled, and restrictions in time and resources prevent the data collection to proceed *ad infinitum*. In order to test all relationships, cases with more intra-case variation on the constructs (be it within the focal organization, or in the industry) are necessary. For constructs where the intra-case variation is low, it is extremely difficult for informants to elaborate on the relationships, beyond speculation and philosophizing. Furthermore, although relationships between some variables within a construct are established, the testing is not always complete. For innovation performance for instance, effects are mostly found for customer performance and reputation. A relationship with financial performance is only established through customer performance, and little can be concluded about relationships with technological performance.

6.4 Implications for Further Research

In addition to the limitations of the study, this dissertation carries several implications for further research. First and foremost, the theoretical model of this dissertation, or parts thereof, should be subjected to quantitative research methods. By using method triangulation, validity, and particularly generalizability, of the findings can be enhanced (Jick 1979). It is the strong belief of the author that qualitative and quantitative methods should be used in support of each other, not in competition with each other. Whereas this dissertation contributes by establishing relationships beyond mere association, quantitative methods will assist in determining the degree of association. Survey research (following Pujari et al. 2003; Pujari et al. 2004), consumer experiments (following Handelman and Arnold 1999), and managerial experiments (to date not undertaken) will help to achieve this goal. Furthermore, formal micro-economic modeling (following Chen 2001) will assist in understanding complex multi-criterion decision making in GPI strategies.

Second, this dissertation brings up questions of the level at which GPI strategy is best researched. This study used the product development project level, following the majority of product innovation research, but also revealed that some constructs were more meaningful on a higher aggregation level. The case research method in this dissertation was able to account for this, but this will not be the case for less adaptive methods. Further quantitative research on a program level might yield more insights, particularly in the antecedents of GPI strategy, than research on a project level (cf. Griffin and Page 1996; Atuahene-Gima et al. 2005).

Third, this study gives insight in the mechanisms underlying the relationship between 'greening' efforts and company performance. Recent research that studied this relationship has produced evidence that studying the relationship between several 'greening' practices and company performance yields stronger results than studying the issue on higher aggregation levels, e.g. environmental investments and company performance (Schaltegger and Synnestvedt 2002; Melnyk et al. 2003; González-Benito and González-Benito 2005). This dissertation has gone one step further by applying a very low level of aggregation. In doing so, it uncovered some of the practices and mechanisms underlying the relationship between green efforts and company performance within the context of GPIs. Similar research should be undertaken to uncover such practices and mechanisms within other contexts of environmental management, for instance green logistics and green operations management. Also, the results of the theory-testing study suggest that a firm should undertake both green and non-green efforts, and that the interaction of the two contributes to company performance. In the theory-testing cases, only one case of a clear 'win-win' phenomenon was observed. Future research should address the practices and mechanisms that underlie the GPI strategies that have managed to reconcile green and non-green issues.

Fourth, the theory-testing study was the first to apply a stakeholder orientation construct that combines scrutiny and scope in information generation. Both research directions in the refinement of the market orientation construct currently exist separately from each other: with research into extending the scope on the one hand (Greenley and Foxall 1996; Greenley and Foxall 1998; Matsuno et al. 2005), and research into improving the scrutiny on the other hand (Chandy and Tellis 1998; Narver et al. 2004; Atuahene-Gima et al. 2005). Scale development for a market orientation construct that encompasses both is therefore much needed. Such research should address both psychometric properties of the scale, as well substantive questions, such as: 'is the set of identified stakeholders complete?', 'are all relevant forces captured adequately by linking them to stakeholders?', 'what methods of information generation represent high scrutiny?'.

Finally, this dissertation suggests that researchers in marketing should devote more attention to the institutional environment as opposed to the task environment (Handelman and Arnold 1999; Grewal and Dharwadkar 2002). In fact, institutional theory might prove very powerful in better explaining the GPI strategies of firms (Jennings and Zandbergen 1995). Relying partly on institutional theory, Bansal and Roth (2000) propose, but do not test, issue salience, field cohesion, and individual concern as explanation why antecedents for greening differ between firms. Especially the aspect of field cohesion is not researched in this dissertation. Field cohesion refers to the "intensity and density of formal and informal network ties" between stakeholder groups (Bansal and Roth 2000, p. 730). Field cohesion is an institutional-theoretic concept that can explain why firms in a field expose similar behavior, or, in other words, are isomorphic (DiMaggio and Powell 1983). Some indicative evidence of mimetic isomorphism, in which firms are driven to similar behaviors by a motivation 'to fit in with the rest', was encountered in the theory-testing cases, particularly in the coatings industry and the shellfish industry. The theory-testing case studies did not investigate the field or industry as such, and are thus poorly suited to follow this

institutional-theoretic stream of thought. Future research, however, should take this perspective, in order to gain a better understanding of the antecedents of GPI strategy.

The research in this thesis is an attempt to integrate research into a Corporate Social Responsibility (CSR) issue in the product innovation management literature. A similar approach can be followed for other CSR issues. CSR has received more attention, by practitioners and academics alike, in many domains of management. A new avenue of research in product innovation management can grow from research efforts that seek to explain how CSR issues are incorporated in product innovation strategy. In doing so, product innovation management research would fill a gap that has been left open for too many years.

Samenvatting (Summary in Dutch)

Inleiding

Een groot aantal bedrijven neemt milieuaspecten mee in de ontwikkeling van productinnovaties. Dit heeft geresulteerd in 'groene' productinnovaties (GPI's), producten waarvan de milieuprestaties significant beter zijn dan conventionele of concurrerende producten. Er zijn verschillende strategieën denkbaar. Zo zijn er bedrijven die producten hebben ontwikkeld die zeer groen zijn, maar ook bedrijven die slechts een kleine milieuverbetering hebben aangebracht in hun product. 'Groenheid' is een relatief begrip. In dit proefschrift staat de volgende vraag centraal: wat zijn de antecedenten, relevante karakteristieken, en gevolgen van groene productinnovatiestrategieën (GPI-strategieën)? Hiertoe worden drie onderzoeksstappen doorlopen (Bonoma 1985).

Stap één (beschreven in *hoofdstuk 1*) bestaat uit een verkenning van het veld, om inzicht te krijgen welke aspecten van belang zijn en hoe deze mogelijkerwijs samenhangen. Uit deze verkenning komt een voorlopig raamwerk van mogelijk relevante constructen naar voren. In dit raamwerk bestaan de antecedenten van GPI-strategie uit marktoriëntatie, technologieoriëntatie en groene oriëntatie. GPI-strategie wordt in het raamwerk gekarakteriseerd met behulp van vier innovatiekarakteristieken (relatief voordeel, groenheid, nieuwheid en productkosten) en drie introductiekarakteristieken (targeting, positionering en marketingmixbeslissingen). De uitkomsten van GPI-strategie worden beschreven met behulp van drie prestatiedimensies: financiële prestatie, prestatie bij afnemers en technologische prestatie. Bovendien worden elementen van de marktomgeving gezien als potentieel modererende constructen in het raamwerk.

Stap twee (beschreven in *hoofdstuk 2 en 3*) van het onderzoek bestaat uit het bouwen van theorie. Hiertoe zijn acht casestudies uitgevoerd, waarbij het onderzoeksproces dat is voorgesteld door Eisenhardt (1989) centraal staat. In dit proces wordt casestudy onderzoek gecombineerd met bestaande literatuur. Het resultaat van deze stap in het onderzoek is een conceptueel model.

Stap drie (beschreven in *hoofdstuk 4 en 5*) bestaat uit het toetsen van theorie. Het conceptueel model dat is opgesteld in stap twee wordt hierin getoetst door middel van vier casestudies. De methode die in deze stap van het onderzoek wordt gevolgd is gebaseerd op het principe van theoretische generalisatie, waardoor het mogelijk is causale relaties te toetsen (Hillebrand et al. 2001).

Casestudies ten behoeve van theorieontwikkeling

Acht casestudies zijn geselecteerd op basis variatie in bedrijfstak, bedrijfsgrootte, succes van het product en groenheid van het product. Hierdoor ontstaat een casestudy design met 4 groene producten in de chemische industrie en 2 groene producten in de levensmiddelenindustrie, met bovendien in elke bedrijfstak één niet-groen controleproduct. De case studies zijn deels ingebed in dezelfde organisaties. In totaal is met

27 informanten een diepte-interview afgenomen. Op basis van analyses van de diepte-interviews en verzamelde documenten zijn een aantal relevante constructen gevonden die ontbreken in het voorlopige raamwerk en zijn patronen tussen constructen geobserveerd. Hieruit worden vier conclusies getrokken. Ten eerste dat GPI niet fundamenteel anders is dan andere productinnovatie, maar dat er wel enkele belangrijke kenmerken van GPI bestaan die gemakkelijk over het hoofd worden gezien bij het hanteren van een traditioneel perspectief van 'niet-groene' productinnovatie. Een essentieel kenmerk van GPI-strategieën is de afweging van groene versus niet-groene productkenmerken tijdens het ontwikkelingsproces. Ten tweede dat het bestaande begrip marktoriëntatie moet worden uitgebreid, zodat het *alle* stakeholders (met name niet-marktgerelateerde stakeholders) omvat en zodat het ook de kwaliteit van informatie weerspiegelt. Ten derde dat marktomgeving, in het bijzonder het bestaan of opkomen van groene marktvraag en/of groene regelgeving, een sterk modererende factor kan zijn. Ten vierde dat de gangbare manier om innovatieprestaties te meten moet worden uitgebreid met andere indicatoren, zoals reputatie.

Theoretisch model

Resource Dependence theorie (Pfeffer en Salancik 1978) biedt aanknopingspunten over hoe organisaties de belangen van marktgerelateerde stakeholders (zoals afnemers en concurrenten) en niet-marktgerelateerde stakeholders (zoals overheden en belangengroepen) meenemen in strategische beslissingen. Er zijn vier uitdagingen voor organisaties die geconfronteerd worden met complexe omgevingen waarin zowel markt- als niet-marktgerelateerde stakeholders een rol spelen: (1) *scope*, het herkennen van belangrijke stakeholders; (2) *scrutiny*, ervoor zorgdragen dat de belangen van stakeholders accuraat worden herkend; (3) *commitment*, het overwinnen van inertie en (4) *balancing*, het afwegen van conflicterende belangen van stakeholders. Literatuur over productinnovatie en milieumanagement met betrekking tot elk van de vier uitdagingen wordt vervolgens besproken. Vervolgens wordt gekeken naar de gevolgen van de beslissingen die rond de vier uitdagingen worden genomen, in het bijzonder voor de waardepropositie en de toe-eigening van waarde. Hieruit volgt een conceptueel model met antecedenten en gevolgen van GPI-strategie (Figuur 3.1). Het model kent drie antecedenten van GPI-strategie: het *commitment* van het top management met betrekking tot milieuzaken, de breedte (*scope*) van stakeholderoriëntatie en de diepte (*scrutiny*) van stakeholderoriëntatie. De antecedenten beïnvloeden de GPI-strategie, in het bijzonder het innovatieproces (de coördinatie van groene aspecten en de prioriteit van groene aspecten), de productkenmerken van de innovatie (groenheid, nieuwheid, relatief voordeel en productkosten) en de introductiestrategie (groene targeting en groene positionering). De GPI-strategie beïnvloedt op haar beurt de innovatieprestaties (financieel, bij afnemers, technologisch en reputatie). Een groot aantal relaties in het model wordt gemodereerd door het type bedrijfstak. Hierbij wordt een onderscheid gemaakt tussen bedrijfstakken met hoge en gematigde milieuimpact (Banerjee et al. 2003). Het conceptueel model is geformaliseerd in een aantal toetsbare proposities.

Methoden voor de toetsende casestudies

De methoden die gebruikt worden voor de toetsende casestudies gaan uit van het principe van theoretische generalisatie, wat wil zeggen dat de resultaten van case-onderzoek geldig kunnen worden verklaard op basis van structurele gelijkenis én logische argumentatie. Dat betekent dat niet alleen wordt gekeken naar het vóórkomen van patronen tussen constructen maar ook een onderliggende redenering voor het causale verband moet worden blootgelegd die aangeeft *waarom* het een tot het ander leidt. Hiertoe zijn vier producten geselecteerd als casestudies, twee in de levensmiddelenindustrie en twee in de chemische industrie, waarvan één longitudinaal. In elke bedrijfstak is één product geselecteerd dat is ontwikkeld in een bedrijf met een gematigd commitment van het top management met betrekking tot milieuzaken, en één product in een bedrijf met hoog commitment. Er zijn 18 diepte-interviews afgenomen en 58 documenten en artefacten bestudeerd. De diepte-interviews zijn gevoerd aan de hand van een uitgebreid caseprotocol, dat erop gericht was de informant zoveel mogelijk informatie te laten verschaffen die inzicht kon bieden in causale relaties. De aldus verkregen data zijn geordend in 836 segmenten, van gemiddeld 250 woorden, en vervolgens gecodeerd met behulp van een softwarepakket voor kwalitatieve analyse. Bovendien is een groot aantal memo's ontwikkeld, die vooral een bijdrage leveren aan de interpretatie van de data. De betrouwbaarheid van de codering is vastgesteld door een externe beoordelaar. Op basis van een steekproef van 425 codes is een mate van overeenstemming van 92% tussen de onderzoeker en de externe beoordelaar berekend.

Resultaten van de toetsende casestudies

De toetsende casestudies ondergaan eerst een beschrijvende analyse, gevolgd door een causale analyse. De beschrijvende analyse leidt tot zes conclusies over het operationaliseren en meten van de constructen in het conceptueel model: (1) Voor sommige antecedenten is het zinvol een onderscheid te maken tussen het niveau van het productontwikkelingsproject en een hoger, organisationeel, niveau; (2) De operationalisering van stakeholderoriëntatie door middel van *scope* en *scrutiny* is zinvol en valide; (3) Sommige constructen kunnen alleen goed begrepen worden door een categorisch perspectief, waarbij bijvoorbeeld coördinatiemechanismen worden geïdentificeerd, als aanvulling op een inschatting van de *mate* van coördinatie; (4) GPI-strategie kan in het algemeen goed worden bestudeerd door naar de uitruil tussen groene en niet-groene aspecten te kijken, maar de uitruil kan in uitzonderlijke gevallen ook omzeild zijn; (5) Reputatie is een relevante prestatiemaat en is verschillend tussen groepen stakeholders; (6) Het herkennen van de *dominant green force* verbetert het begrip van bedrijfstakomgeving.

De causale analyse legt vier algemene patronen bloot (zie tabel 5.13 voor meer details): (1) De toetsing laat zien dat oriëntaties richting niet-marktgerelateerde stakeholders een bijdrage leveren aan het groener maken van productinnovatiestrategieën en dat oriëntaties richting marktgerelateerde stakeholders het groener maken juist belemmeren; (2) *Scrutiny* in de oriëntaties ten opzichte van afnemers, belangengroepen, en regelgevers is zowel een antecedent van prioriteit van groene aspecten als van groenheid; (3) Relaties van groenheid met groene targeting en met prestaties bij af-

nemers zijn positief, maar zwakken af naarmate groenheid verder toeneemt; de relaties van groene targeting en groene positionering met prestaties bij afnemers worden zelfs negatief (omgekeerde-U relaties); (4) Marktspecifieke componenten zijn verantwoordelijk voor het modererende effect van bedrijfstakomgeving.

De resultaten geven aanleiding tot een typering van GPI-strategieën van elk van de vier cases: sociale verantwoordelijkheid met rationele planning, sociale verantwoordelijkheid en het opbouwen van een reputatie, legitimatie door voldoen aan regels en, als laatste, concurrentievermogen door toeval. De typeringen laten zien dat het patroon van de gevonden causale relaties binnen elke case redelijk coherent is en vertonen overeenkomsten met een bestaande typologie van milieustrategieën in het algemeen (Bansal en Roth 2000).

Conclusies

Het empirische deel van het onderzoek bestaat uit 42 interviews, die in totaal ongeveer 68 uur in beslag namen, met 45 informanten. Samen met de literatuurstudie en documentenanalyse heeft dit geleid tot het ontwikkelen en toetsen van een model met antecedenten en gevolgen van GPI-strategieën. Hierdoor levert het onderzoek een bijdrage aan de literatuur over marktoriëntatie en productontwikkeling. In het bijzonder laat het onderzoek zien hoe het bestaande begrip marktoriëntatie kan worden uitgebreid, en zo een betere verklaring wordt verkregen van de relatie tussen marktorientatie, innovatiestrategie, en prestaties. Bovendien levert het onderzoek een bijdrage aan de specifieke literatuur over groene productontwikkeling door een systematisch raamwerk te ontwikkelen en toetsen, door te wijzen op niet-lineaire verbanden, het beter begrijpen van het modererende effect van bedrijfstak, en door te wijzen op niet-traditionele prestatiemaatstaven voor innovatiesucces zoals reputatie. Daarnaast laat het onderzoek zien hoe casestudy-onderzoek niet alleen kan worden gebruikt voor exploratieve doeleinden, maar ook voor het toetsen van theorie.

Het onderzoek leidt tot het formuleren van een aantal aanbevelingen voor praktijkmensen. De belangrijkste aanbeveling voor managers is om op te passen voor *'overgreening'*. Groener is niet altijd beter, maar er bestaat een optimum. Bovendien laat het onderzoek een aantal methoden zien waarmee managers afwegingen kunnen maken tussen groene en niet-groene aspecten, naast de vaak aanbevolen, maar weinig gebruikte, methode van levenscyclusanalyse. Daarnaast suggereert het onderzoek dat bedrijven baat kunnen hebben bij het verbreden en verdiepen van stakeholderoriëntatie en dat de optimale GPI-strategie sterk afhankelijk is van de marktomgeving. Ook geeft het onderzoek aanleiding tot aanbevelingen aan milieubeleidsmakers. De resultaten laten zien dat zowel direct ingrijpen door regelgeving als indirect ingrijpen door pogingen de markt voor groene producten te stimuleren effect hebben op innovatiestrategieën. De resultaten laten echter ook zien dat sommige regelgeving die beoogt groene productinnovaties te stimuleren er juist toe leidt dat bedrijven producten ontwikkelen die *minder* groen zijn. Methoden om afwegingen tussen milieu-aspecten te maken, zoals levenscyclusanalyse, zouden beleidsmaker kunnen helpen om dergelijke perverse effecten te voorkomen.

De beperkingen van het onderzoek zijn hoofdzakelijk te wijten aan de gebruikte methode. Alhoewel er in het onderzoek veel aan is gedaan om de generaliseerbaarheid van de resultaten te verhogen, zijn de resultaten beperkt generaliseerbaar. De casestudies laten vooral zien wat bijzonder is aan GPI's en welke relaties tussen belangrijke elementen van GPI-strategie bestaan, én waarom. Ze geven bijvoorbeeld niet aan hoe sterk de relaties zijn of hoe vaak bepaalde fenomenen vóórkomen. Bovendien zou er vertekening kunnen zitten in de interpretaties van de causale relaties en konden niet alle causale relaties worden getoetst door gebrek aan gegevens. De resultaten van het onderzoek zouden in toekomstig onderzoek moeten onderworpen aan kwantitatieve methoden. Bovendien roept het onderzoek de vraag op of GPI-strategie het best kan worden bestudeerd op het niveau van productontwikkelingsprojecten óf -programma's. Het onderzoek geeft bovendien inzicht in de onderliggende mechanismen van de relatie tussen milieu-inspanningen van bedrijven en hun prestaties. Toekomstig onderzoek zou deze relatie kunnen onderzoeken met behulp van casestudies in andere domeinen dan productontwikkeling. De resultaten geven ook aan dat het verder ontwikkelen van het begrip stakeholderoriëntatie nuttig zou zijn. Tenslotte geeft de studie aan dat onderzoek in marketing meer aandacht zou moeten besteden aan de institutionele omgeving en institutionele theorie.

Dit proefschrift behelst één van de eerste pogingen om onderzoek naar Maatschappelijk Verantwoord Ondernemen te combineren met bestaand en gevestigd onderzoek naar productinnovaties. Maatschappelijk verantwoorde productontwikkeling heeft in de bestaande en gevestigde productinnovatie literatuur tot nu toe bijzonder weinig aandacht gekregen. Hierdoor is een lacune in de literatuur te lang blijven bestaan.

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Appendices

Appendix 1: Field Version of the Theory-Testing Interview Guide

This interview guide (in Dutch) was used by the interviewer during the interviews in the theory-testing stage. In preparation of the interview, the interviewer used a training guide, which was more elaborate. Not every category of questions was applicable to every informant. Applicability of the questions is indicated for each category of questions: RD: Research & Development; MK: Marketing; GM: General Management. The order of the question categories was rotated between interviews.

1. Informant

- Functie?
- In dienst sinds?
- Rol bij innovatie??

2. Innovatiekarakteristieken **RD/MK**
(← stakeholder orientation & innovation process)

- Voordelen
- Nieuw voor bedrijf, bedrijfstak, afnemer
- Kosten nieuwe product
- Milieuvoordelen
- Afweging milieu/andere kenmerken

- Invloed van stakeholders
- Informatie verzamelen, gebruiken
- Invloed van innovatie proces (belang milieu/designstrategie)

Check stakeholders: afnemers, concurrenten, regelgevers/overheden, toeleveranciers, distribuanten, medewerkers, milieu/consumentengroepen, eigenaars

- Stakeholder invloed constant?
- Indien minder/meer rekening met belangrijkste stakeholder…(andere markt, ander product, concurrerend product)
- Minder/meer informatie
- Belang van milieu in proces constant?
- Indien minder/meer nadruk op milieu in proces…(andere markt, ander product, concurrerend product)
- Andere bedrijfstakomstandigheden: bijv. andere markt, tijd, trends, concurrenten

3. Innovatieproces
(← stakeholder orientation & green top mgt. commitment) **RD/MK/GM**

- Betrokkenen / product champion
- Organisatie
- Milieu-champion
- Andere milieu deelnemers

- Uitgangspunten/PvE
- Ambities milieu

- Waarom grote/kleine rol milieu?
- Invloed van stakeholders
- Informatie verzamelen, gebruiken
- Milieu commitment directie
- Commitment bij dit project

Check stakeholders: afnemers, concurrenten, regelgevers/overheden, toeleveranciers, distribuanten, medewerkers, milieu/consumentengroepen, eigenaars

- Stakeholder invloed / commitment constant?
- Indien minder/meer rekening gehouden met belangrijkste stakeholder…
- Indien minder/meer commitment…
- Andere bedrijfstakomstandigheden (bijv. andere markt, tijd, trends, concurrenten)

4. Introductiestrategie MK
(← stakeholder orientation & product characteristics)

- Doelgroep
- Groene positionering. Voorbeelden
- Distributie, acties

- Waarom niet/wel groene positionering?
- Invloed van stakeholders
- Informatie verzamelen, gebruiken
- Productkenmerken

Check stakeholders: afnemers, concurrenten, regelgevers/overheden, toeleveranciers, distribuanten, medewerkers, milieu/consumentengroepen, eigenaars

- Stakeholder invloed / productkenmerken constant?
- Indien minder/meer rekening gehouden met belangrijkste stakeholder…
- Indien minder/meer milieuverbetering product…
- Indien product meer/minder innovatief…
- Andere bedrijfstakomstandigheden (bijv. andere markt, tijd, trends, concurrenten)

5. Prestaties van het product GM/MK/RD
(← product characteristics & introduction strategy)

- Succes (criteria)
- Technologisch
- Consumenten
- Financieel
- Reputatie
- Prioritering

- Waarom wel/niet succes? (evt. verschillende succesmaten)

- Productkenmerken, marketing, of iets anders
- Groenheid, nieuwheid
- Introductiestrategie

- Marketing / productkenmerken constant?
- Indien meer/minder groene marketing…
- Indien meer/minder milieuverbetering product…
- Indien meer/minder innovatief…

6. Context **GM/MK/RD**

- Trends en ontwikkelingen
- Belang van milieu in bedrijfstak
- Vervuiling, strenge regelgeving, publieke betrokkenheid, aansprakelijkheids-risico
- Vergelijking met verleden (met name trends) en denkbeeldige toekomstige markt
- Vergelijking met deelmarkt, buitenland, concurrenten

7. Vervolginterviews/extra informatie

- Afspraken over rapportage, email adres
- Kunt u namen noemen van andere mensen die een rol hebben gespeeld bij de ontwikkeling of introductie van het product?
- Beschikbare documenten?

Appendix 2: Coding Scheme for the Theory-Testing Cases

Numbers between brackets indicate the level within the hierarchy. Codes on levels one and two were not assigned to text fragments, but serve to categorize only.

(1) Descriptive and Within-Construct Causal
(2) - x commitment
(3) . - green commitment
(4) . . - green commitment lo
(4) . . - green commitment hi
(4) . . - green commitment top mgt
(4) . . - green commitment firm
(2) - x stakeholder orientation
(3) . - so general
(3) . - scrutiny
(4) . . - scrutiny lo
(4) . . - scrutiny hi
(4) . . - scrutiny dialogue
(4) . . - scrutiny different research techniques
(4) . . - scrutiny procedure
(4) . . - scrutiny participatory observation
(4) . . - scrutiny market test
(4) . . - scrutiny reverse engineering
(4) . . - scrutiny visionaries
(4) . . - scrutiny informal relationships
(3) . - scope
(4) . . - scope no
(4) . . - scope yes
(4) . . - market orientation
(5) . . . - customer orientation
(5) . . . - competitor orientation
(4) . . - regulator orientation
(4) . . - shareholder orientation
(4) . . - supply chain members orientation
(4) . . - employee orientation
(4) . . - other orientation
(4) . . - special interest groups orientation
(2) - x process
(3) . - coordination
(4) . . - coordination lo
(4) . . - coordination hi
(4) . . - coord thru written norms
(4) . . - coord thru procedure
(4) . . - coord thru env champion
(4) . . - coord thru org structure
(4) . . - coord thru team composition

(4) . . - coord thru discussion
(4) . . - coord thru system
(4) . . - coord thru portfolio planning
(4) . . - coord thru objectives
(4) . . - coord thru radical projects
(4) . . - coord thru project group
(4) . . - coord thru hse criteria
(4) . . - coord thru growing awareness
(4) . . - coord thru external advisors
(3) . - green priority
(4) . . - green priority lo
(4) . . - green priority hi
(4) . . - green prio thru benchmark
(4) . . - green prio thru stakeholder priorities
(4) . . - green prio thru ecolabel standards
(4) . . - green prio thru explicit issues
(4) . . - green prio thru quantifying env costs
(4) . . - green prio thru lca
(4) . . - green prio thru lab tests
(4) . . - green prio thru balancing
(4) . . - green prio thru resisting undesirable pr
(4) . . - green prio thru constraint
(4) . . - green prio thru motto
(4) . . - green prio thru elimination by aspects
(3) . - coordination - green priority
(2) - x product
(3) . - greenness
(4) . . - greenness lo
(4) . . - greenness hi
(3) . - relative advantage
(4) . . - relative adv lo
(4) . . - relative adv hi
(4) . . - relative adv equal
(3) . - product costs
(4) . . - product costs lo
(4) . . - product costs hi
(3) . - new
(4) . . - new to the customer
(4) . . - new to the firm
(4) . . - new to the firm administrative
(4) . . - new to the industry
(4) . . - new hi
(4) . . - new lo
(3) . - greenness - rel adv
(3) . - greenness - prod costs
(2) - x introduction
(3) . - green targeting

(4) . . - green targeting lo
(4) . . - green targeting hi
(3) . - green positioning
(4) . . - green positioning lo
(4) . . - green positioning hi
(4) . . - green pos educational component
(4) . . - green pos thru ecolabels
(4) . . - green pos nature event
(4) . . - green pos balanced
(4) . . - green pos simple
(4) . . - green pos complex
(3) . - green targeting - positioning
(2) - x performance
(3) . - customer perf
(4) . . - customer perf lo
(4) . . - customer perf hi
(3) . - financial
(4) . . - financial hi
(4) . . - financial lo
(3) . - technological
(4) . . - technological lo
(4) . . - technological hi
(3) . - reputation
(4) . . - reputation lo
(4) . . - reputation hi
(3) . - performance general
(4) . . - performance gen lo
(4) . . - performance gen hi
(4) . . - performance other
(2) - x environment
(3) . - ind. ecological impact
(4) . . - ind. ecological impact lo
(4) . . - ind. ecological impact hi
(3) . - stringency of green regulations
(4) . . - stringency lo
(4) . . - stringency hi
(3) . - green liability risks
(4) . . - green liability risk lo
(4) . . - green liability risk hi
(3) . - level of public concern
(4) . . - level of public concern lo
(4) . . - level of public concern hi
(4) . . - level of pc green market size
(3) . - environment other
(4) . . - level of green competition
(4) . . - green requirements distributors
(3) . - mod general

(1) Causal
(2) - x comm - proc
(3) . - commitment - process
(3) . - commitment - green priority
(3) . - commitment - coordination
(3) . - mod comm - proc
(4) . . - mod comm - proc by green liability risks
(2) - x so - proc
(3) . - so - process
(3) . - sig orientation - process
(3) . - cust or - green priority
(3) . - employee or - process
(3) . - market or - green priority
(3) . - market or - coord
(3) . - reg or - coord
(3) . - shareholder or - process
(3) . - competitor or - green priority
(3) . - mod so - proc
(4) . . - mod so - proc by stringency
(4) . . - mod so - proc by public concern
(2) - x so - prod
(3) . - so - product
(3) . - sig orientation - product
(3) . - cust or - product
(3) . - competitor or - product
(3) . - supply ch member or - product
(3) . - employee or - product
(3) . - cust or - rel adv
(3) . - reg or - product
(3) . - reg or - greenness
(3) . - cust or - greenness
(3) . - cust or - newness
(3) . - other orientation - newness
(3) . - cust or - product cost
(3) . - mod so - prod
(4) . . - mod so - prod by stringency
(4) . . - mod so - prod by market size
(2) - x so - intro
(3) . - cust or - intro
(3) . - so - introduction
(3) . - competitor or - intro
(3) . - competitor or - green pos
(3) . - mod so - intro
(4) . . - mod so - intro by stringency
(4) . . - mod so - intro by market size
(2) - x proc - prod
(3) . - process - product

(3) . - green prio - greenness
(3) . - coordination - product
(3) . - coordination - greenness
(3) . - mod proc - prod
(2) - x prod - intro
(3) . - product - green targeting
(3) . - greenness - targeting
(3) . - product - introduction
(3) . - greenness - positioning
(3) . - product - green positioning
(3) . - newness - positioning
(3) . - rel adv - green positioning
(3) . - mod prod - intro
(4) . . - mod prod - intro by market size
(4) . . - mod prod - intro by public concern
(4) . . - mod prod - intro by stringency
(2) - x prod - perf
(3) . - product - performance
(3) . - product - cust perf
(3) . - rel adv - performance
(3) . - greenness - performance
(3) . - newness - perf reputation
(3) . - mod prod - perf
(4) . . - mod prod - perf by public concern
(4) . . - mod prod - perf by stringency
(4) . . - mod prod - perf by market size
(2) - x intro - perf
(3) . - green positioning - perf
(3) . - introduction - performance
(3) . - green targeting - performance
(3) . - mod intro - perf
(4) . . - mod intro - perf by market size
(4) . . - mod intro - perf by stringency
(2) - Relationship
(3) . - relationship negative
(3) . - relationship not present
(3) . - relationship positive